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The Personnel Journal

DEVOTED TO INDUSTRIAL PSYCHOLOGY

The Science of Work, the Human Factor in Management and the Satisfactory Adjustment of Individuals to Their Occupations

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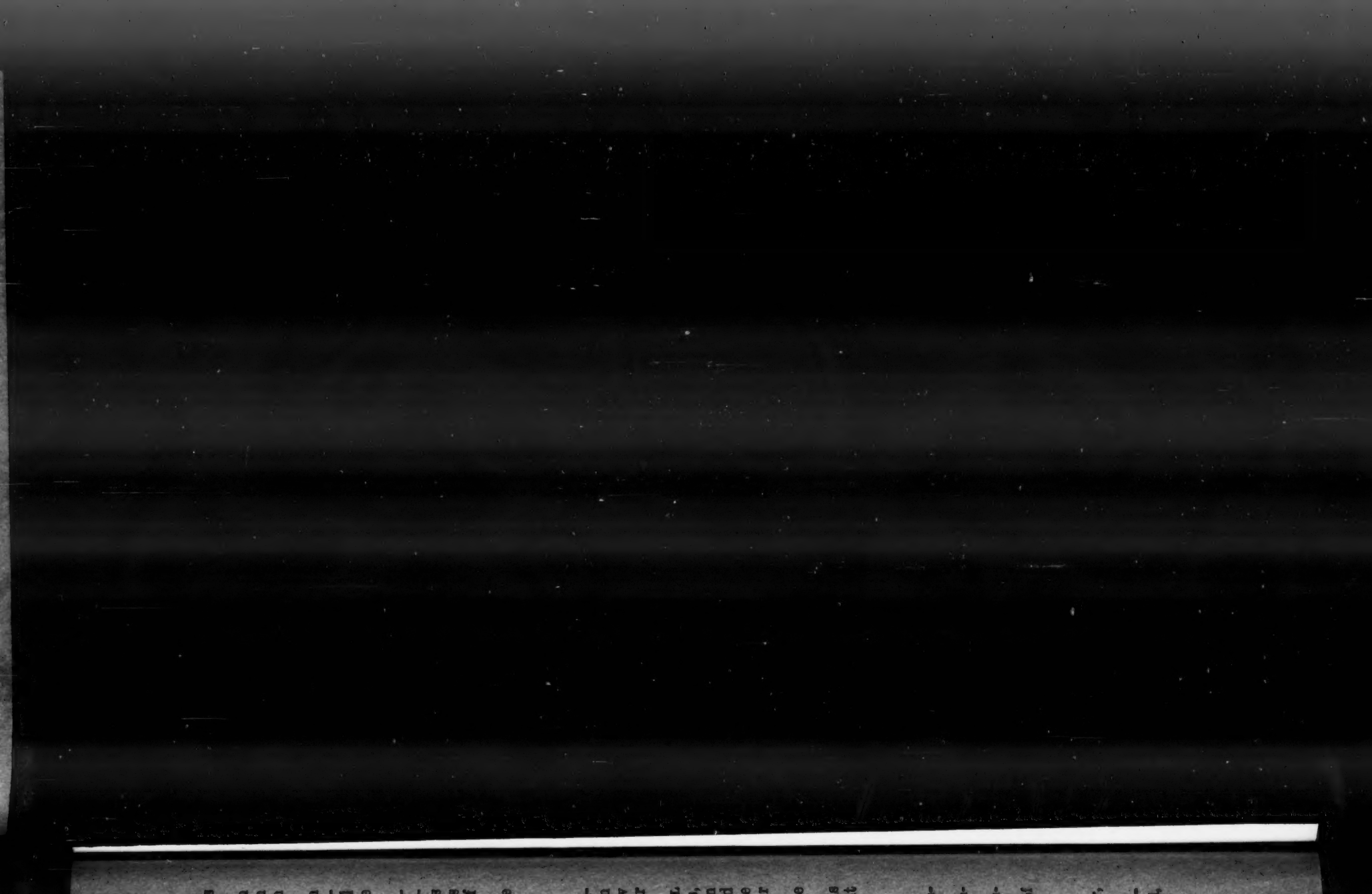

Psychological Study of Accident Proneness*

By Eric Farmer, *Industrial Health Research Board, London*

Susceptibility to accident is no mere matter of bad luck. It is associated with certain external working conditions, such as unfavorable temperature. It is related even more closely to individual constitution, nervous integration, occupational proficiency, personal habits, preoccupations and attitudes.

This practically important problem of accident causation has been the subject of continuous investigation in England for more than ten years. Results of these highly significant inquiries are here summarized by one of the foremost leaders in this field of research.

THE Industrial Health Research Board, with headquarters in London, receives a Government grant for the purposes of carrying out research on problems connected with the human side of industrial efficiency. Among the many problems to which it has directed its activity is that of accident causation. It has approached the matter from many points. Several of its investigators have contributed to the study of this particular problem. The results of their studies on accident causation are described briefly in this paper.

Mrs. E. Osborne and Dr. H. M. Vernon by installing recording thermographs in two large munition factories were able to record the approximate temperatures at which accidents occurred. Their results showed that accident incidence was at its lowest at a temperature of 67°F. Dr. H. M. Vernon and Dr. T. Bedford studied the relation between temperature and accident rate in a group of collieries and found that the accident rate of those working at the coal face was in direct relation to the temperature of the seam—the higher the temperature the greater the accident rate. A further investigation carried out by the same investigators showed that the relation between accident rate and temperature was mainly accounted for by the less severe accidents, the rate of which was higher in the hotter seams than in the cooler, whereas the serious accident rate remained approximately the same. They accounted for this by suggesting that there is a tendency for the miners more readily to report minor accidents when working under conditions of extreme heat.

Osborne and Vernon also found from

*Paper presented at a meeting of the Psychological Section of the British Association for the Advancement of Science.

a study of 50,000 accidents in munition factories that accident rate and speed of production were positively related and that the accident incidence when a 12-hour shift was worked was 2.5 times greater than when a 10-hour shift was worked.

This brief mention of some of the work of my colleagues by no means does it justice, but my object is not to discuss their work in any detail but merely to mention it so that it will be seen that accident causation is being studied from many points of view, and that the inquiry is not confined to the particular aspect with which I am more familiar. I now propose to deal in somewhat more detail with that aspect of the problem with which my own work has brought me into closer touch, with a view to indicating the methods adopted and the results obtained, and also the lines that are now being followed in the continuation of the investigation.

In 1919 Dr. M. Greenwood and Miss H. M. Woods were the first to point out that accidents were not normally distributed. They examined the accident distribution of various groups of munition workers exposed to equal risks in order to test three hypotheses that might account for the shape of the curve of frequency distribution.

The hypotheses tested were:

(1) That all workers are equal in respect of accident liability, so that accidents are truly accidental i.e. the result of chance;

(2) That all workers start with an equal liability but that the incurring of an accident modifies the chance in respect to further accidents;

(3) That the liability of workers to sustain accidents is not equal and that some are inherently more liable to sustain them than others.

The result of the statistical analysis carried out by these investigators showed that the last hypothesis, i.e. that individuals differ in accident susceptibility, was the one that best accounted for the facts and they further showed that the frequency curve was J-shaped, which means that the bulk of the accidents in any group is sustained by a relatively small number of individuals in the group.

This early work of Greenwood and Woods was continued by Miss E. M. Newbold when peace conditions had been sufficiently long restored to make the examination of a large number of industrial accident records possible. Newbold examined 16,000 accident records specially kept for the purpose by a large number of firms, and retested the hypothesis thatGreenwood and Woods had put forward. The result of her work fully confirmed the original conclusions of Greenwood and Woods which may now be regarded as established in view of the extensive data analysed.

Newbold also showed that there was an inverse relation between accidents and age and accidents and experience, the younger and less experienced sustaining more accidents than the older and more experienced. She also found a positive correlation between minor accidents and minor sicknesses,though there was no relation between minor accidents and serious sicknesses; and also that there was a positive correlation between the number of accidents incurred by the workers over different

periods of exposure. Further she devised a statistical test for determining whether the accidents of a group of workers are mainly due to conditions affecting all the workers in approximately the same degree or whether they are mainly due to a small group of workers having an unduly large number of accidents.

The results of these statistical researches are important for psychology for they clearly delineate the psychological problem and also indicate to some extent the methods to be followed and the results that may be expected from a psychological research having a diagnostic end in view.

The psychological investigation that Mr. E. G. Chambers and I carried out was based upon the results of the statistical inquiry. From this we knew:—

(1) That accidents were not normally distributed, certain people being more susceptible than others, and we endeavoured by means of psychological tests to discover any characteristics which differentiated these people from others;

(2) That the frequency curve was J-shaped, so that no high correlation could be expected between tests with a normal saddle-backed distribution and accident rate. The distribution of most psychological test scores is saddlebacked and this may be one of the reasons why at present no high correlations have been found between any psychological tests and accident rate;

(3) That the number of accidents sustained by an individual in one period correlates with the number sustained in another. This relative permanence of accident proneness enables psychological tests to be compared with accident incidence in some limited observational period and if a positive relation is found between any tests and accident rate in that period it may be assumed with some degree of certainty that the same relation will hold in non-observed periods of exposure, so that the results have a certain degree of permanent value;

(4) That the majority of accidents in any group are sustained by a few individuals. In order, therefore, that a test may be of diagnostic value in regard to accident proneness it should be possible by means of it to detect a small number of people with a high accident rate. A test can be regarded as having fulfilled this condition when the accident rate of those in the lowest quartile is greatly in excess of that of those in the other three quartiles.

The method Chambers and I adopted was to test various groups of industrial workers equally exposed to risk and compare their performance in the tests with their accident rate over as long an observational period as possible. During the course of the investigation various tests were used. It would take too long to describe each test in detail but they included

various intelligence tests, sensori-motor tests of varying complexity, special tests for strength, stereoscopic vision, ocular muscle balance, judgment of speed and pressure, and also for steadiness and hand control. In 1926 the Board published a preliminary report of our work based on the examination of 650 subjects, in which it was shown that those whose performance was below the mean in a particular group of sensori-motor tests had an accident rate 48 per cent greater than that of those who were above the mean. This particular group of sensori-motor tests, which all involved rapid and accurate coördination between afferent nervous impulses and muscular movements, intercorrelated positively among themselves and so were called 'aesthetokinetic' tests to distinguish them from sensori-motor tests in general, which do not intercorrelate except among young children and mental defectives.

Miss Newbold raised the point in her report as to whether major and minor accidents correlated but her data did not permit of her coming to any conclusions. We were fortunate in being able to analyse the accident records of 16,000 dockyard employees and a positive correlation between minor and major accidents was found for most of the trades examined. This conclusion is important because the incidence of major accidents is so small as to make it almost useless for measuring the value of psychological tests for accident proneness. If, however, any psychological tests are found to correlate with minor accidents and it is known that these correlate with major accidents, then we may be relatively certain that the tests will have diagnostic value not only for minor but also for major accidents, although it is not practicable to measure this directly.

The conclusions put forward in our preliminary report were recognised as needing corroboration and a further report based on the examination of 1843 subjects has recently been published by the Board. The original conclusions are confirmed by this more extensive investigation and a positive relation has also been shown to exist between intelligence and accident rate. When the intelligence and aesthetokinetic tests were combined and weighted according to their relation to accidents it was found that the accident rate of the worst 25 per cent of the subjects was 2.5 times greater than that of the remaining 75 per cent, so that if these tests had been used for selective purposes the accident incidence of the groups examined would have been sensibly reduced.

In some of the groups of subjects examined it was impossible to distinguish between industrial and non-industrial accidents, and moreover in these groups lost time through accidents involved no financial loss to the workers. The accident rate of these subjects tended to increase with experience rather than diminish, as in the case of the other groups and as Miss Newbold had also found in all the purely industrial groups she examined. The inference, therefore, is clear that these records were not reliable indicators of real accident proneness because the inclusion of non-industrial accidents rendered the exposure of

the subjects unequal, and also on account of the tendency to report minor accidents with a view to getting off work. It is interesting, therefore, to find that in these groups there was no relation between any of the tests and accident rate, the tests having a positive relation with accident rate only in the purely industrial groups where these sources of error were not present.

It was also found that tests having a positive relation to accident rate also had a similar relation to industrial proficiency. This conclusion is of value for practical purposes for it means that if these tests were used for vocational purposes, a group of workers would be selected by them who on the whole would be more proficient at their work and have fewer accidents than those rejected by the tests, so that the use of these tests would serve a dual purpose and increase industrial efficiency in two different ways.

Another interesting result was that the correlations between the psychological tests and accidents increased in direct proportion to the length of exposure to risk. It is clear that accident rate can only be taken as equivalent to accident liability if it is the accident rate of the whole working life. This is obviously impossible to record and accident rate can only be obtained for experimental purposes over a limited observational period, but the longer the period from which the rate is obtained the closer will it approximate to a real measure of accident liability. If therefore the correlation coefficients increase in size in proportion to the length of the observational period, it means that the more reliable the measure of accident liability the closer is its relation to the tests, from which it may be inferred that the tests do in fact measure some factor which is a fundamental constituent of accident proneness, the full effects of which can only be determined when the accident rate of the whole working life is known.

The relation between accidents and the other psychological tests that were used remains indeterminate at present. In psychological testing of this kind it is unwise to draw conclusions unless they are based upon results that have consistently repeated themselves in several groups of sufficient size to reduce the operation of chance to a minimum. The data concerning the other tests does not yet satisfy these requirements and so I do not propose to discuss it. The investigation is being continued and as time goes on sufficient reliable data will be obtained to warrant conclusions being drawn. The relation between intelligence, aesthetokinesis and accidents has been determined and a careful examination of the data gives no indication that further research will yield a closer association between these functions and accidents within groups similar to those examined than that already obtained. It is, however, obvious from the size of the correlation coefficients that there are other determinants in accident proneness besides intelligence and aesthetokinetic coördination, and the relation between other psychological functions and accidents is now being explored. Should positive results be obtained it will be possible to delineate

more accurately the nature of accident proneness and to form a battery of tests that will measure its various constituents.

One outstanding problem in connection with accident causation is whether accident proneness is specific to the occupation or general in nature. There are no data at present to warrant any suggestion as to its solution but the question is obviously one of great importance for practical purposes and efforts are being made to explore it. It is closely connected with the nature of vocational aptitudes and the relative importance of the general and specific constituents.

I have endeavoured to show in this paper that accident causation is being scientifically studied and that some progress has been made, so that we are less ignorant now than we were a decade ago; but I shall have failed in my purpose if I give the impression that anything like a full solution of the many aspects of the problem has been reached. The methods described are capable of considerable development and doubtless other methods will be employed as the work continues. It is to be hoped that further progress will be made so that psychology may render a practical service that will increase industrial efficiency and lessen human suffering.

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A Check on Character Analysis

By Adelbert Ford, *University of Michigan*

Spurzheim and the Fowler brothers, Shades of Goll, apostles of phrenology, occasionally return in novel guise, this time under the aegis of "Vitosophy."

A commercial system, based partly on the use of skull measurements and purposing to give accurate character analyses, was applied to a sample of 18 university students under rigidly controlled laboratory conditions. The average correlation of the character analysts' ratings with university grades and self-ratings was not appreciably higher than was obtained by pure chance.

THE prevalence of large numbers of individuals and organizations aiming to sell systems of character analysis to employment departments justifies an occasional check of the value of such enterprises and repeated warning to the psychologically untrained that these activities illustrate good salesmanship but poor science. Our experience has been that most of these so-called character analysts are sincere in their beliefs, but are thoroughly ignorant of even the most simple types of statistical validation.

About a year ago a system under the trade name of "Vitosophy" was brought to our attention, the promoters asking that we make an impartial test of its possible validity. A portion of its technique had been taken over from the phrenological methods of the late Dr. Russel Haigh Windsor. The exponents of the system were undoubtedly sincere, and there was no evidence of any attempt at dishonesty in working out the validation.

The technique used in arriving at character readings may be outlined as follows. A circular instrument resembling a halo, with a hinged semicircle swinging over the entire top of the head, was pinned into the aural canal of each external ear. Measurements, with a maximum of ¼ inch error, were taken from this instrument to the surface of the skill at a large number of places. The dimensions and curvature of the skull were very accurately indicated by means of graphs for each of the three spatial dimensions. In addition to the blondness or brunetteness of the subject, there were noted the heat of the subjects breath on the back of the examiner's hand, the formation of the teeth, and the character of the mouth. If there were other signs used, they escaped our observation.

Due to the large amount of work

required to measure each subject, and the expenditure on equipment, the examiners refused to analyze more than twenty subjects as a basis for validation. In order to secure statistically valid results we had to use an average of several correlations on the same subjects. Actually we used only eighteen subjects, one having been read twice to establish a self consistency rating, and the other having been omitted because of a skull abnormality which the character readers thought would prevent their system from working. We clothed every subject in a gray laboratory coat to cover cues which might be obtained from clothing, forbade the subject to talk during the examination, gave each subject a pseudonym and a serial number on the record sheets to prevent the character readers from looking up the school grades before their final ratings were made.

The "character readers" graded each subject on the following abilities: mathematics, written speech, general science, general scholarship, general intelligence, mechanical ability, musical talent. The first four traits were to be checked against the subjects' average grades made in the university; the general intelligence was compared with the Army Alpha scores; mechanical and musical abilities were estimated on the basis of self ratings of the subjects. In general practice these "character analysts" relied heavily on self ratings in selected cases to prove the worth of their system.

TABLE 1

Correlations between "Vitosophy" scores and other measurements of ability; also between lottery scores and these measurements of ability

	CORRELATION WITH VITOSOPHY GRADE	CORRELATION WITH LOTTERY GRADE
Mathematical ability, estimated by grades received in university classes	−.16	−.24
Written speech, estimated by grades received in university classes	.32	−.1
Scientific ability, estimated by grades received in university science classes	.10	.15
General scholarship, based on average grades in all college classes	.23	−.38
General intelligence, as measured by Army Alpha test scores	−.21	.24
Mechanical ability, as estimated by the subject being measured	−.55	.16
Musical ability, as estimated by the subject being measured	−.31	.07
Average correlation for all traits	−.08	−.01

In order to show these exponents of phrenology how the results of their system compared with pure chance,we built a lottery box for random drawing of colored marbles. The marks assigned by the "character analysts" were A, B, C, D, and E, corresponding to the system of marking used in the university. Eighteen colored marbles in five colors were used, each color

representing a letter grade. For every letter grade assigned by the examining analyst there was an appropriately colored marble. The distribution of grades represented by the marbles, therefore, was identical with that assigned by the "character analyst." Each subject then had grades assigned for a given trait by drawing colored marbles at random from a hole in the box. Correlation tables were now made showing the relationship of the "Vitosophy" grades to the students college grades, Alpha test, or self rating. Another set of correlation tables was made showing the relationship of the lottery grades to the same measures of ability. We used the Pearson formula for unscattered data:

$$r = \frac{\Sigma\, xy}{\sqrt{\Sigma\, x^2 \cdot \Sigma\, y^2}}$$

The results of the correlations are given in table 1.

According to the assumptions of the "character analyst" the correlations in column one should have been positive every case. The number of negative correlations is about what one would expect on the basis of pure chance, with a small number of cases. It is safe to say, from this table, that the use of "Vitosophy" in predicting scholarship in the university is worthless, or at least not proven. Where self ratings are made the basis of the validation and are secured free from mental suggestion, a condition not at all fulfilled in the office of the "Vitosophist," there is no evidence of valid correlation. We believe that the system would be no better when used for industrial purposes.

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Measuring Leadership

By Elizabeth H. Morris, New York State College for Teachers

To estimate personal fitness for various occupations demanding leadership is a task of such importance that in spite of its complexity and difficulty it challenges scientific effort.

Fitness for specific lines of work is often conditioned largely by personal characteristics. Measures of the fundamental trends of personality and of such characteristics as accuracy, assurance, etc., should be viewed as parts of a composite estimate of the individual instead of being used separately.

A technique employed in detecting the kind of leadership which contributes significantly to success in teaching has shown that the following kinds of measures are useful: direction and degree of feeling, typical social attitudes, tactfulness in comment and action, and insight and social judgment. These traits are measured indirectly as well as directly, and results scored in a differential rather than descriptive fashion. The scores may be combined in a profile rating chart which offers possibilities for scientific study of individual differences.

A STUDY of personal characteristics significantly related to success in teaching furnishes not only specific suggestions with reference to fitness for that profession, but also some principles and hypotheses useful in determining fitness for other lines of work as well. This article gives some such suggestions which have been developed from the writer's investigation and measurement of leadership and related characteristics.[1]

The question, "How can we make the wisest selection of candidates for a particular kind of training?" presupposes the more fundamental questions: "What kind of person is best for this line of work?" "How can we measure degrees of such suitability?" Even the effort to name the kinds of persons best adapted to certain activities throws us back to another problem, that of making a satisfactory classification of personal characteristics. Thus the first general suggestion is: Develop a workable analysis of personality.

Such descriptive terms as *industrious, lazy, dependable, irresponsible, resourceful, tolerant,* and so forth are ambiguous. (Cf. op. cit. pp. 7, 8). For example, does resourcefulness mean quickness to respond to a situa-

[1] For details concerning "Personal Traits and Success in Teaching" see the author's book of that title published as Contribution to Education, No. 342, 1929, Bureau of Publications, Teachers' College, Columbia University.

tion, or ability to make a variety of responses, or is it a combination of both? Is the tolerant person desirably open-minded or undesirably "spineless"? Surely we need a definite conception of what we are trying to measure before we can devise satisfactory techniques for measuring it. A second suggestion, therefore, is: Have a definite and objective standard of the trait to be measured.

The idea of a desirable kind of person for certain work implies a combination of characteristics rather than single separate factors. A person is not the embodiment of one trait but the blend of many. If these blends of traits constituting the make-up of different individuals are to be understood scientifically, we must consider a third principle, namely, the components must be relatively distinct and must be measurable both as entities and in combination. For example, suppose that in trying to find the differences between good and poor teachers we agree that both tact and insight are important assets of good teachers. In our effort to allow for individual differences, yet to keep constant the essentials for success, we are faced with such questions as: How much do tact and insight overlap? How much do they influence each other? Probably in attempting to measure one we are inevitably making some estimate of the other. Our result is therefore not as clear cut and valuable as if we had the three things already implied, namely: (*a*) Better Standards of Success, i.e., knowledge of what tangibly constitutes good and poor teaching; (*b*) better understanding of the fundamental factors of personality or total human make-up; (*c*) a working list of distinguishable traits which can be measured both individually and as blends; (*d*) also a clear grasp of what various possible combinations of these traits constitute the desirable kinds of people; (*e*) an understanding of how characteristics of good teaching are related to the fundamental characteristics of people; and (*f*) some understanding of how much the important factors may be developed or on the other hand to what extent they must be present to start with. For example, can a person who seems to lack initiative be educated so as to acquire it? Is coöperativeness inborn or acquired? (Cf. op. cit. p. 61)

Though work is needed on each of the above problems, the following points may be taken as a working basis:

Fundamental trends of personality are probably better expressed in such terms as intellectual make-up, emotional characteristics (including intensity, breadth, and stability), and drive or self-expression tendency, than in such traditional terms as perseverance, accuracy, integrity, etc. (Cf. op. cit. pp. 8, 9)

A composite measure should be used rather than any single determiner of fitness, since it provides for recognizing both the uniqueness of individuals and the characteristics common to all who succeed, in contrast to the characteristics of those who fail.

The popular conception of the value of a balanced personality is corroborated by the fact that individuals showing similar ranks in various kinds of measures show a consistent tend-

ency to get along better than those persons who rank very high in some respects and very low in others. (Cf. op. cit. pp. 57–58)

The person who succeeds notably in any given line of work may well be considered a leader in his field, and it is such a practical form of leadership which we probably should try to measure rather than an abstract entity, "leadership" in general. (Cf. comments on industry and persistence, op. cit. p. 11) It is useful to think of the social implications of such leadership as is especially valuable in the profession of teaching. This profession puts a premium upon the ability to inspire others to fruitful activity. Analysis of such ability (Cf. op. cit. Ch. III, especially p. 10) suggests that for determining any form of leadership it is valuable to try to discover the following:

1. *Definite likes and dislikes* concerning objects of interest in the field considered. For example, reading is a considerable activity in a teacher's life. Does the person being considered like reading or not? Also, how intense is the liking or dislike? The technique of finding out about likes and dislikes may be carried out through forming a list of items concerning attitudes, ranging from "like very much" through "like," "neither like nor dislike," and "dislike" to "dislike much." The markings of such a list give a scorable estimate of the individual's expression of direction and degree of feeling. Such a list (formed from the suggestions of Barr, Freyd, and others) was used in the writer's Trait Index L designed to supplement intelligence tests, health ratings, and other measures in selecting candidates for teacher-training. (Cf. op. cit. p. 14)

2. *Characteristic social feelings.* Some people regard as amusing a situation which others, even in the same position, consider embarrassing. Such difference in feeling is indicative of individual differences which may be of considerable importance in determining fitness or unfitness for lines of work wherein such situations are likely to arise.

3. *Tactfulness in comment and action.* Though we may not know completely what constitutes tact, we can unhesitatingly designate some comments or acts as more or less tactful than others under given circumstances. Thus by describing situations typical of professional problems, and by mentioning various possible responses, we have some possibility of measuring different amounts of tact for certain kinds of situations.

4. *Insight and social judgment.* Probably these characteristics are among the most essential for leadership in teaching. While they seem to correlate more closely with intelligence than does tact, they are to be distinguished from intelligence. Insight probably suggests less feeling-tone than does intuition, but insight and intuition both imply a relatively unanalyzed though correct interpretation of more than overt aspects of social relations. For instance, the individual who realizes in how far the following statement is true, "What pupils learn depends on the teacher more than on themselves," grasps the true meaning of some school situa-

tions. He may have this grasp without going into all the "whys" and "wherefors," and this grasp encourages fortunate attitudes.

5. *Complex social attitudes* as evidencing initiative or its lack, aggressiveness, timidity, and so on.

The writer had these five features in mind in constructing her Trait Index L, as more fully described in "Personal Traits and Success in Teaching," pp. 13–18. Use of that Index brought out the possibilities of modifying it and applying its techniques in the measurement of leadership for lines of work other than teaching. (Cf. op. cit. pp. 56–60) The difficulties of scoring and the importance of securing measures of both the separate aspects and the blend of factors in personalities led to two further principles:

(1) Score in a way to *differentiate* between the promising and unpromising candidates. The way in which it is possible to do this is too complex to explain here, but the possibility and value of such "differential" (rather than "descriptive") scoring is explained in pp. 19–26 of the study mentioned.

(2) Combine total score, indicating general rank in leadership of the type measured, with scores on separate sections to secure measures of significant individual differences other than those of general rank. Such combination is most convenient in a profile summary such as the writer has described in her Teacher's Handbook published by the Public School Publishing Company of Bloomington, Illinois to accompany their issue of "Morris Trait Index L."[2] The profile summary is constructed on the plan of plotting decile ranks which an individual attains in the various kinds of measures used.

This profile summary furnishes data which are valuable for further interpretation. For example, high average of ranks in the various measures is a good sign; some consistency in the rankings in the various measures is an advantage, great discrepancy a disadvantage; moderate degree of some traits (such as emotional intensity, assurance, etc.) is probably more desirable than extreme degree; for some traits, variations within a certain range are not significant but outside of this range are important. For example, rank in the sixth decile in accuracy seems to mean little more than rank in the fourth decile, but a ninth decile rank is a definite asset whereas only a first or second decile rank in accuracy is a real handicap.

Profile charts are summaries of many kinds of measures, too complicated to describe fully within the scope of this article; but studies already made show that they are very useful ways of combining measures of various aspects of personality, and that they also suggest important principles for further scientific investigation of personal traits.

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[2] It might be stated that sections I, II, III, IV, V, and VI of this revised issue of Morris Trait Index L correspond respectively to sections I, IIB, IIC, III, IV and V of the original Trait Index described in "Personal Traits and Success in Teaching."

Skill and Specialization

Part II. The Significance of Skill

By Mildred Fairchild, *Bryn Mawr College*

This analysis of the skill of the workman in relation to the specialization of his work is continued from the June number of the Personnel Journal. *Part I dealt with The Nature and Measurement of Skill.*

1. TESTING THE TECHNIQUE

WORKERS' SCHEDULE[42]

THUS far we have discussed the technique employed in this study for evaluating skill, and the determination of a skill-index for each of the 75 workman studied. It then became necessary to test the technique by relating the skill-index established to certain other characteristics of the workmen. The study collected evidence telling of the significance of skill in relation to the work done and to the social and psychological life of the workmen performing it.

Reference to the workers' schedule which was used will show how case studies were made of each workman. Information regarding them was grouped into three divisions. The first division concerned (a) the physical conditions of the job, (b) the trade history of the workman,—i.e., his trade training and experience,—and (c) his social background, namely, his nativity, education, type of home and leisure-time activities. In the second division, the investigator rated the workman on (a) his habits of work, (b) his skill at work, (c) his adjustment to unusual demands in work, (d) his attitude toward his work, and (e) his attitude toward the management of his plant. The third division sought to discover from the workman the source of his satisfaction in his work, in an effort to find out something about the relation between his skill and his satisfaction. The information in the first division of the schedule was based on the workman's statements to the investigator, supplemented by the employment records. The ratings in the second division are the investigator's ratings based upon her observations, supplemented by the opinion of foremen and management. The ratings of the third division were the investigator's, based upon the workman's statements as drawn out in interview.[43]

[42] The workers' schedule appeared as Appendix B to Part I of this paper in the June issue of the Personnel Journal.

[43] A uniform method of interview was impossible, because of differences in firm policy. In two plants it was carried on within the factory at the convenience of

As to some of the things these case records showed, sixty-two of the 75 men were American born. The nativity of the workmen apparently had no relation to their skill attainment; nor did marital state, size of family, type of home, or leisure-time activities show any relation to their skill attainment. Obviously the men lived, married, had children and adopted certain types of recreation with no definite relationship to the work they did. Tables XIV, XV, and XVI in Appendix D give the details of these points.

Education, on the other hand, (that is, the amount of schooling which a workman had received before going to work) his trade experience and his wage showed, in general, a certain relation to his skill attainment as measured by the skill-index. So also the ratings on production standing and skill, as judged by the management, habits of work, attitudes toward work and management showed variations with the skill-index which merit attention. Tables VII to XI in Appendix D give the detail of these ratings in the four plants.

METHODS OF RATING

The homes of the men were observed on four counts: type of house, (single, duplex, row or tenement), space (number of rooms per person), condition of repair, and the existence of a yard or garden. A simple rating scheme was worked out by which each home could be graded and the grade reduced to 100 per cent. The type of house was graded primarily on a basis of light and air exposure, one point for a row or tenement, two points for a duplex, and three for a single house. Space was rated one point for less than one room per person, two points for one room per person or one or two rooms in excess, and three points for more than two rooms in excess of the number of persons. Children under five years were counted as one half a person. A total of 12 points thus constituted 100 per cent.

With the exception of skill, the ratings on the workers' schedules were all quite simple. Production standing was rated as above average, average or below average, as shown by the records of output or the rating of the management. Habits of work were rated on a basis of orderliness, system, plan and regularity in work and attendance, as judged by the investigator over the period of the study and as checked by the management. Adjustment to the unusual in work was rated on a basis of adjustments to rush work, overtime work, night work, an unfamiliar job and a new process. Attitude to work was rated according to the workman's attitude toward his regular operation, toward the regular set-up of his machine, and toward variation in either; upon the basis of his confidence in his ability to handle the work, of his sense of security in employment, and of his satisfaction in work as judged by his satisfaction in

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workmen and investigators, both during work and in rest periods. In one plant it was accomplished by visits to the workmen's homes. In one plant, both types of interviews were possible and were obtained, with, incidentally, the most complete and satisfactory results. Factory interviews were found necessary for the best skill analysis, but insufficient for personal information. Home interviews proved better for the latter but difficult for the former. Both types of interview throughout the study would have given better and more complete results.

job, wage or conditions of work. Relation to management was rated according to the workman's response to suggestion, acceptance of criticism and readiness to coöperate with the management. Characteristics rated were given points one, two or three, according to whether they were counted as poor, average or good, and the total reckoned on a per cent basis.[44]

The information sought by the workers' schedule regarding skill, or perhaps better, regarding craftsmanship, was classified under technical knowledge, manual dexterity, sensitivity and personality. Technical knowledge includes the workman's technique of handling machine, materials and tools, and such principles of mechanics as are essential to the machinist. The word knowledge has been used for lack of a better word. It must be understood to include the muscular and kinaesthetic adaptions and appreciations which are an integral part of knowing how to handle the machinists' techniques, tools and materials. It cannot be considered a purely mental function. A machinist's knowledge of materials necessarily includes not only any book learning he may have on the subject, but what might be termed a muscular appreciation of the speeds and feeds appropriate to the strength and resistance of the material he works. The two aspects are hardly separable. A better term, and one more accurately describing the characteristic sought would have been habituation. Manual dexterity would have been more accurately termed muscular dexterity since it concerns not only the hand but all the muscular faculties used. Sensitivity means the developed sensitivity of eye, ear and touch actually used, irrespective of native capacity in that regard. Finally, certain personality characteristics were included as a part of the total industrial skill. Judgment, readiness for responsibility in tackling work, such as shows itself in the handling of materials and tools, planning either before or as work proceeds, and the like, were counted skill factors of an intangible but integral character.

All these factors, again, were rated one, two and three according to their grade. And quite arbitrarily total values were given each factor in the proportions of: technical knowledge, 40 points; manual dexterity, 21 points; sensitivities, 9 points; and personality, 30 points—a total of 100 points.

Disagreement with this rating, and with the factors included in it, are legitimate. It was attempted simply as an experiment within a new field. The judgments were made after the operations had been observed and charted, but before any therblig-skill-averages had been computed. Each workman was discussed with the foreman and at least one other member of the management—employment manager, member of the time study department, or superintendent—whose opinions were used to check the ratings. Comparison across the entire range of work in all the factories was attempted since the object of the ratings was partially an inter-factory comparison. In

[44] Attitude ratings were based upon the investigator's judgment resulting from interview and observation over the period of the study. No objective method of evaluation was found. The judgments were seasoned ones, however, and the result of careful analysis.

other words, all of the selected men in the four plants were compared in the skill rating.

The relations between these various factors and the skill-index were shown by a series of correlations. These were made between the various skill-indexes and the ratings on production standing, skill, habits of work, attitude to work and relation to management; and between the indexes and the education, trade training and average weekly wage. Table IV gives the correlations made and their probable errors.

SKILL-INDEX AND PRODUCTION STANDING

Between the skill-index and the production standing of the workmen the correlations on three plants are positive and rather high. But in Plant A they are insignificant. The exact reason for the lack of correlation in Plant A is not clear. Possibly it was due to the nature of the work which was largely repetitive. Such work would not lend itself to analysis on the basis adopted for the study. Skill, as defined and charted, may not include the factors of primary importance to high output on repetitive tasks. Speed of work and steadiness at work, for example, may be the qualities essential for any man to maintain a high production in repetitive work, and the skill-factors included in the simo-skill-chart as now developed may be secondary in the requirement. If that be true, the skill of Plant A would seem to be little more than a high type of proficiency and not skill at all. Conceivably the low correlation between the skill-index and production standing in Plant A may itself be highly significant. It is perhaps characteristic of a mass-production shop that a man of high production is not necessarily a man of high skill, at least as skill is defined and analysed in this study.

THE SKILL-INDEX AND SKILL RATING

In comparing skill-indexes and skill ratings, Plants B, and C show high correlations, A and D low correlations. Correlations between the skill-index and skill rating might of course be expected. It must be remembered that the two skill evaluations are not concerned with identical facts. The skill rating estimates and grades the skill which it was thought the man possessed, while skill index grades the actual skill shown on an operation. As it happens the skill rating includes in far larger proportion than does the skill-index the factors which Pear[45] would term the "accident" as opposed to the "propria" elements, and which Bezanson[46] would term the "accidental" factors of skill. Knowledge and personality factors enter into the skill rating which are distinct from muscular skill, although in the opinion of the writer they are so closely allied as to be integral to performance. These factors do enter into the charted skill of performance but to a lesser degree. A consequent variation between rating and index is quite reasonable, and might be expected. It might well, also,

[45] See T. H. Pear, The Nature of Skill. *Journal of the National Institute of Industrial Psychology*, October, 1928, vol. IV, pp. 193–202.

[46] See Anne Bezanson, Skill in Industry. *Quarterly Journal of Economics*, 1921–22, vol. 36, pp. 626–645.

be most apparent at the extremes of the range represented by Plants A and D, inasmuch as the skill ratings both vary less from man to man within the plant than do the skill-indexes, and their means vary more between plants than do the mean skill-indexes, unweighted in accordance with the variation in skill factors as the latter are. The low correlations of Plants A and D, therefore, may be significant of the two extremes of the sampling, or they may be due to a concentration of low skill ratings in Plant A and of high skill ratings in Plant D. Of course, also, they may be evidence of an unsatisfactory skill rating. Conceivably this more general and subjective estimate of the workman's skill abilities might differ fundamentally from the skill-index with its greater flexibility and more specific skill evaluations, also with its limitation to skill on the job at a specific time.

THE SKILL-INDEX AND HABITS OF WORK AND ATTITUDE TOWARD WORK

The meaning of the comparisons between the skill-indexes and the ratings on habits of work are more readily understood if one refers to the frequency tables, as they are also between the skill-indexes and the ratings on attitude toward work and on relation with the management. (Tables XX, XXI, and XXII, Appendix D.) Apparently there is some relationship between the skill-indexes and habits of work and between the indexes and attitude toward work. The habits of work of all the men tend to be rated as high, however, expecially in Plants A and D.

The man who is a skilled worker may not necessarily be neat, orderly and systematic in his work, but in Plants A and D at least, all of the workmen, whatever their skill, tended to be so. Moreover, even in Plants B and C the correlations are somewhat lower than in the previous instances, and a study of the cases reveals a like tendency for all workmen to be rated rather high in this regard. Whether the plants all incline to select men with good habits of work, or to train them into good habits whatever their natural aptitudes, or whether the selection of the investigation favored the neat and systematic workman, is hardly determinable.[47]

A somewhat similar factor enters into the relation between the skill-indexes and the men's attitude toward their work. In Plant D most of the men were rated as having a favorable attitude toward their work. A study of the cases on attitude, however, shows what every psychologist would expect, that there are men with a low skill-index, particularly when reckoned on a factory basis, whose attitude toward their work indicates a fair degree of satisfaction. This subject is discussed a little later where the question of skill and its relation to satisfaction is considered more fully.

THE SKILL-INDEX AND THE RELATION OF MAN TO MANAGEMENT

Relation of man to management seems to follow to little or no degree the skill of the workman, insofar as the former was evaluated by this study. In all four plants, the relation of the men with the management

[47] The writer has no memory of such selection.

tended to be rated as high. Plant A had more low ratings than any other. More than half the selected men in each plant were placed in the highest groups. Little of the variation which occurred was related to the skill of the workman as evaluated by the skill-index. A study of the case record indicates rather that the low ratings were due primarily to personality difficulties. Possibly the workman disliked the foreman, or he was distrustful of the time-study policy or indignant over the treatment of a works council. Occasionally he exhibited a sullen or suspicious disposition in general. Sometimes he found it difficult to accept a foreman's suggestions and disliked what he regarded as interference or carping criticism. In some of the more skilled men there was a sense of being driven or of what they regarded as a lack of appreciation for the niceties of their work. No particular effort was made to analyse these difficulties or to study them in detail. So far as the data of this study are concerned, however, such difficulties proved not to vary with the skill of the workman.[48]

SKILL, EDUCATION AND TRADE TRAINING

According to the data, skill does not vary with schooling or with trade training. If these data may be trusted the attainment of skill is dependent on some factors other than schooling and trade training, but a study of the cases indicates that in the higher grades of skill, education and trade training are more often than not associated with it. And the relation is more definite in the case of general schooling than it is with specific trade training.

It is evident that a man without a high grade of schooling and who has not served an apprenticeship may attain the higher ranks of skill. Nevertheless the cases show that in Plants C and D at least, the more skilled men ordinarily have reached a higher grade of school and have had the apprenticeship training, in whole or in part, although less skilled men also may have had it and with less effect. (See Tables XXIII and XXIV Appendix D.) Neither schooling nor apprenticeship training seems to assure a man of a high grade of success, nor does the lack of either bar him from attaining it. If these figures are significant, they show that in work requiring the higher grades of skill, apprenticeship, and at least a complete elementary education, are more often than not associated with the more skillful workman.[49] The inference for vocational guidance is obvious.

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[48] Quite possibly the selected men do not represent a typical group in this regard, in any of the plants. Undoubtedly men who were coöperative by nature were in many instances chosen for observation and study, since these were the men most readily interviewed by the investigators and least disturbed by their presence while at work. Such men might be expected to rank high in their relation with the management and might, therefore, constitute a somewhat selected group in this regard. Moreover, even with long interviews and continuous association, and the resulting discovery of many hidden and perhaps only half conscious reactions, evaluation of this relation was probably too superficial to be regarded with entire confidence. It may be that a more specific and carefully devised rating system might yield quite different results.

[49] In order to make a statistical comparison, the data on trade training had neces-

SKILL AND WAGES

Finally, skill as evaluated by the skill-index seems to have a significant relation to wage; but in all factories, especially in Plant A, (See Table XXV, Appendix D) it does not seem to be the only factor in wage determination even within one plant. A study of the mean skill-index and the mean average weekly wage between factories, as estimated over a period of three months,[50] shows that progression is comparable between the two in Plants B, C and D, but that in Plant A it is not comparable. The suggestion is that in plants requiring similar skill, the degree of skill needed affects the wage paid. But where a lower mean skill is required (as in Plant A) other factors enter, such as the necessity for a competing wage. In all cases, apparently, wage measures in part something besides either skill or output. And since it is recognized that precedent, market rates and other factors do enter into the determination of wage, the relation brought out here seems to be reasonable.

CORRELATIONS AS TEST OF VALIDITY AND EVIDENCE OF RELATIONSHIP

In making such a series of comparisons and correlations, one is confronted with a dual problem. In the first place, the reliability of the data must be considered. Especially in a new field, where one is necessarily experimenting with new methods of work, it is essential to study certain facts of association in order to test the validity both of the method and of the data which it yields. Significant correlations covering a considerable number of cases are regarded commonly as evidence of validity, and the evidence, of course, increases with the number of cases. Only after the method and data are considered valid, can the significance appear of the relationships which the associations and correlations bring out.

This duality handled simultaneously is never quite satisfactory. Yet simultaneous handling has been necessary in much sociological and psychological study to date. Anything like confidence in the results has come about, therefore, only with development of the study and increase in the numbers of cases accruing to it. The use of intelligence testing, for example, either as to method or as to results obtained, won general confidence only with repeated successes covering large numbers of cases.

In this instance the correlations in the opinion of the writer seem to establish the validity of the method and the reliability of the data which it yields. They indicate that the skill-index based upon the simo-skill-chart

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sarily to be reduced to a grading system. No training other than that picked up at work was given a grade of one point; training in another trade, on the assumption that transfer of some kind of skill might occur, was given two points; an upgrade or a so-called vestibule type of training in the present trade, three points; a partial apprenticeship in the present trade four points; and a completed apprenticeship in the present trade five points.

[50] Wage included full-time earnings plus bonus on production. It did not include any overtime earnings.

and derived from the therblig-skill-average of the workmen offers a comparative skill evaluation between workmen which appears to be both practicable and trustworthy. Especially the correlations between the indexes and production standing and wage are significant, since both production standing and wage were objective ratings. At the same time the whole series offers illuminating evidence of the relationships between skill and various habits, attitudes and experiences which is far from negligible.

Throughout the study of the correlations Plant A has shown individual tendencies distinct from the other plants. Correlations which have appeared for the other plants have repeatedly failed for Plant A. At least two reasons for this suggest themselves. Either the method of the skill-index, or rather the analysis of skill used to form the index, is not so suitable to the type of proficiency needed and utilized in Plant A as it is to the skill needed in the other plants, or the application of the method was not so exact in Plant A as it was in Plants B, C and even D. The fact that frequency tables tend to bring out comparable relations which the correlations obscure might incline one toward accepting the second alternative. On that interpretation the indexes as determined, even in Plant A, might in general be considered significant, their trends and averages suggestive, even though under specific analysis and comparison, such as that of the correlations, they failed to give statistical evidence of their accuracy

The other interpretation, however, is quite open to consideration and acceptance. As previously stated, the proficiency which turns out quantity goods in a mass-production shop may very possibly be primarily one of speed of movement and steadiness of work, combined with accuracy in working. Judging from the therblig-skill-averages attained by the workman of Plant A, some skill, as evaluated by the skill analysis, also must be needed, but with the exception of accuracy of movement, it may be a secondary requirement. In that event, very much the degree of association which the data here have revealed should be expected.

The tendency of Plant D to show similar failures of correlation, even though usually for an apparent and a different reason, may support either one of these interpretations for Plant A. Only further research can decide the issue.

For Plants B and C, on the other hand—and with production standing, education and wage, for Plant D also—the correlations and comparisons have both verified the use of the skill-index, as developed here, for skill evaluation, and have at the same time produced noteworthy evidence of the relationships to be expected between the workman's skill and certain other factors in his personality and his experience closely associated with it.

The method requires much development and improvement throughout, but its scheme is evidently useful. The information it has produced already is significant, as are also the relations, which it has indicated as probable between skill and output, skill and wage, skill and education and

trade training, and skill and the attitudes of the workmen.[51]

[51] All relationships which have been considered significant have been tested by Hart's tables on *The Reliability of a Percentage.* See Hornell Hart, The Reliability of a Percentage, *Journal of the American Statistical Association*, March, 1926, vol. 21, pp. 40–46.

2. SKILL AND SATISFACTION

A CONCEPTION OF SATISFACTION

The word satisfaction, like the word skill, is broad in concept and has long been used without precision. To attempt to analyse it, or to base any discussion upon its observation may seem to many persons unwise, if not preposterous. Satisfactions are, it will be claimed, subjective estimates only of a man's reactions to his environment and experience; they are therefore closed to analytical observation and discussion.

An attempt to evaluate satisfaction in any such specific terms as this study has evaluated skill, crude though the method and result of skill evaluation are, would seem to the writer at this point impossible. But the workman's satisfaction, both to the sociologist and to the psychologist, and it may be also to the industrial engineer, is so closely allied to the question of his skill that some attention need be given to it here, even though a thorough analysis is not possible.

For the purposes of this study, satisfaction has been considered to mean *a sense of actual contentment or enjoyment coming to a man from a particular experience.* A sense of satisfaction in a particular object, activity or condition may be interpreted to mean a pleasurable sense of fulfillment, which, however slight, is an active element in a man's thought or experience. Mere lack of discontent, or indifference, will not be included in the meaning of the word here.

THE RATING ON ATTITUDE TOWARD WORK

A few pages back, the rating of the workmen's attitude toward their work, by a grading of low, average or high, was discussed. The determining factors were: his attitude toward the operation he performed, or the set-up, or variation in either; and whether he felt satisfaction with his wage or with his surroundings. A much more detailed analysis might have been worked out. In a study concentrating upon or centering around the subject of attitude or satisfaction, such detail would have been essential. But even with the cursory nature of the rating, the resultant grades register an attitude evaluation which is pertinent.

A study of the ratings on attitude toward work shows the mean grades for the four plants to be; for Plant A, 63.5, for Plant B, 80., for Plant C, 82.7, and for Plant D 84.3. (See Table VIII, Appendix D.) These figures indicate that in attitude toward job, wage and surroundings, the men in three of the plants ranked very closely together, but in one considerably lower. In two of the plants, it will be remembered, the ratings correlated positively with the skill-index of the workmen, that is, in Plant B at .48 and in Plant C at .79. In Plant A the correlation proved to be insignificant

(.23). In Plant D, also, the correlation proved insignificant (−.13). But a frequency table showed that all workmen tended to rate comparatively high in attitude.

SATISFACTION IN JOB, WAGES AND CONDITIONS OF WORK

A more detailed rating was attempted during the course of the investigation.[52] Here the object was to discover the workman's satisfaction with his (1) job, (2) his wage and (3) his conditions of work, by locating the source of his satisfaction in each. A grading of A, B or C was given him according to the number of sources (as listed in the workers' schedule) which gave him satisfaction in job, wage, or conditions of work. But no effort was made to evaluate the degree of satisfaction due to any source.

The sources included under job were the physical pleasures of activity, posture, rhythm and the use of trained muscles; the mental pleasures proceeding from the use of capacities, from the ability to fulfill requirements, and from the stimulus to learning or invention arising from the work; and the emotional pleasures, if they may be so termed, arising from the quantity, quality or beauty of the product, from a sense of usefulness, from successful competition, and from prestige. The sources included under wage were the workman's power to supply the necessities of life for himself and his family, to acquire certain luxuries in a comfort standard, and to be able to advance himself or his children in the rising social scale. The sources included under conditions of work were the status of the physical plant, its surroundings and facilities, its recreational, educational and social opportunities, the security of employment and opportunity for promotion, the relations with foreman and management and the relations with fellow employees.

Where the investigator found two or less than two sources of satisfaction in the job for a workman, his satisfaction on the job was graded as C; if she found three or four, it was graded as B; and if over four, as A. One type of source was not considered superior or inferior to another. Where the investigator found that the workman considered the wage enough only to provide his family's or his own basic needs, his satisfaction in wage was graded as C; if he thought it capable of supplying certain luxuries besides it was graded B; if he counted it as enough also to advance his children or himself—for one may safely count that as an ultimate aim of all American workmen of this type—it was graded A. Likewise, under conditions of work, the number of sources of satisfaction graded the men into the three classes. Two sources or less were graded as C, three or four were graded as B, and over four as A. As stated above, the resulting grades are purely quantitative, and not at all measures of the degree of satisfaction in any source.

The results of all estimates appear in Table XII, on page 166. Conceding that these figures do actually indicate the sources of the workmen's satis-

[52] See Part C of Workers' Schedule, which appeared as Appendix B to Part I of this paper in the June issue of the PERSONNEL JOURNAL.

factions, they are very interesting indeed. In satisfactions arising from the job, in Plant A, 3 out of 25 men belong to the A group, 7 to the B group, and 14 to the C group; in Plant B the distributions are nearly equal; in Plant C all 10 men, and in Plant D 17 out of 20 men, belong in the A group. In wage satisfactions, at Plant A, 19 of the 25 men belong in the B group, at Plant B 8 out of 14 men belong in the A group, at Plant C 7 out of 10 belong in the C group, and at Plant D 12 out of 16 were graded A. In satisfactions arising from conditions of work, Plant A men are graded 13 in Grade B, and 9 on Grade C, Plant B men 12 in Grade A, Plant C men 9 in Grade A, while Plant D men are distributed nearly evenly.

A study of these figures indicates that the selected workmen at Plant A tend to find their main satisfaction in their wages, some in conditions of work, and very few in the job. The selected workmen at Plant B find their satisfaction primarily in conditions, with wage and job supplementing. The selected workmen at Plants C and D, on the other hand, find their satisaction primarily in the job, with, at plant C, conditions ranking a close second and wages ranking low, and at Plant D wages ranking second and conditions distributing evenly.

SKILL AS THE FIRST SOURCE OF SATISFACTION TO THE WORKMAN

Inasmuch as both the mean and median skill-indexes, as shown previously, increased from Plants A to D, (the means of the S. $I._3$ varying from 67.2 to 108.5 between Plants A and D respectively[53] the conclusion seems justified that where skill exists to a considerable degree it tends to become the first source of satisfaction to the workmen. Where it exists to a lesser degree, it tends to drop out as an active element. Satisfaction in conditions of work or in wage becomes predominant only where satisfaction in skill has materially decreased.

But whether or not lack of skill becomes an active source of discontent seems to depend upon individual temperament and make-up. Among workmen doing repetitive work there was a certain black-eyed, quick-moving Scotchman, one of the more skilled men in the plant, who rebelled at the repetitive nature of his work. The investigator found him eager to read and to talk, liking Ibsen's plays and wanting to discuss them, and doing so with a clear-headed, native critical ability delightful to see and hear. Life would be intolerable but for the evening's recreation he claimed, and he saw no chance of advancement or change in his work. Then there was a German, a graduate of the University of Heidelberg, who operated a turret lathe, performing an operation the cycle of which was complete within a few minutes' time. He had been doing the same work for four years and did not expect to change it. He found little enough in his work to interest him, and for recreation no companions available who were congenial to his tastes. A third workman, this time American, somewhat comparable to the other two, had a native talent for painting, sketched in water colour at

[53] See Table I, page 51, June issue of the PERSONNEL JOURNAL.

every opportunity and glowed with interest only when discussing it. All three of these men rated high in skill and all three showed a maladjustment to their situation which, if not tragic, was at least thought-compelling and sobering to the observer.

Against these cases range those 3 out of 25 workmen in Plant A, who apparently liked their work thoroughly. The most striking of these was a man whose job was repetitive beyond any others, who operated one of the machines requiring the least skill of any among the selected tasks. He had completed the eighth grade in school before beinning work, which means that his schooling was above the average among the selected workmen in Plant A. Nevertheless, easy going, cheerful, talkative and humorous as he was, his job suited well his tastes and ambitions. If it ever wearied him, and there was no evidence that it did, he had always the foreman or a fellow workman to chaff. He found in the investigator an endless source of amusement so long as she lingered within or near his sight or hearing.

These four cases were outstanding but they were also typical of the problem among the men performing repetitive tasks. There were workmen among the most skilled of these who exhibited certain active dislikes for some phases of their work. There were others with far less skill development who found it quite satisfactory.

The question of intelligence and its relation to success and contentment in repetitive work naturally arises. Miss Isabel Burnett[54] made an interesting study of this subject, in which she reached the conclusion that high intelligence yielded less success and less contentment in repetitive work than an average intelligence, especially if it was combined with a less erratic disposition. In a repetitive task continued over an eight-week period, the workers ranking high in intelligence tests and erratic in an adding test failed to equal the output of a worker ranking lower in the tests. They also suffered more from the monotony of the task. A worker, on the other hand, showing a subnormal grade in the intelligence test, although exhibiting a surprising improvement in her work during the eight weeks of the experiment, was unable even at the finish to compete successfully with the other three. Also she found the competition a constant source of annoyance.

In the present study, no intelligence tests were thought possible.[55] The correlation of intelligence quotient and skill-index, or the comparison of intelligence and satisfaction in work, are therefore out of the question at the moment. Careful observations, however, seem to indicate agreement to some extent at least with Miss Burnett's conclusions.

The criticism commonly uttered that repetitive work produces general discontent in workmen did not, in any such sweeping terms, receive support from these findings. There were men with low skill-indexes who found more sources of satisfaction in their work than others with high ones. There were men doing repetitive work who

[54] Isabel Burnett. *An Experimental Investigation into Repetitive Work.* Industrial Fatigue Research Board Report, No. 30. London, 1925.

[55] The workers' schedule originally contained a section attempting to evaluate mental qualifications, but it was abandoned as impracticable and useless.

found more sources of satisfaction in that work than others doing a much more varied type of work. At the same time a study of the cases indicates that the men who expressed satisfaction in their work were for the most part, men who were successful, from the standpoint of their skill-index or production standing, in their own grade of work. The first and most obvious comparison which any man made, it would seem, was between himself and others doing the same kind of work. Success in what he did appeared to be satisfying to many a person when what he did was very simple, in comparison with what others at no great distance from him did. An evaluation of success on the job therefore, might conceivably correlate more positively with a skill-index formed on a process base than with one formed on a factory base.

But the case study indicates also that an assumption of a correlation in either event is not justified because the reverse of the above proposition will not prove true. The man who likes his work may seem to be one who does it well, but the man who does work well may not like it also. According to the findings of this study, at least one other element is related to that result. The workman apparently must respect his work as well as his performance of it to find it a satisfactory outlet for his energies. And that respect evidently varies with his individual experience and concept of himself in relation to it.

It is signicant that the maladjusted persons found among the selected workmen were doing repetitive work. There were workmen interviewed among those engaged in more varied work who found causes for indifference or discontent in their work, but none who spoke contemptuously of it. One may argue that repetitive work utilizes successfully certain maladjusted persons unable to perform satisfactory the higher types of work, or one may argue that the nature of repetitive work is itself productive of such maladjustment. Possibly both propositions have an element of truth in them. The fact remains that the repetitive work is obviously unsuited to men such as the three described above, although the responsibility for their maladjustment and any unhappy results of it probably belong to society as much as to industry.

The conclusion from both the statistical analysis and the case study of this material is that where skill is given play it becomes in the workman developing it much the greatest source of his satisfaction. Satisfaction in wage, and satisfaction in the conditions of work supplement it or not as the case may be. But definitely they tend to be counted as subsidiary. Where skill is not given play, satisfaction in wage or conditions do predominate in the workman's mind. If the man's capacity or training are suited to what is required of him, the lack of opportunity for the use or development of skill may be no drawback to him. The physical activity, or rhythm, or the quantity of product he can turn out, or occasionally the sense of power over his machine may even give him an active pleasure in his job. If his capacities or training have not suited him to it, however, so that he feels himself either superior or

inferior to it, he may or he may not do it well, but in either case he probably finds it a source of driving discontent.

BASIC SATISFACTION FOR ALL WORKMEN IN SENSE OF CAPACITY

A careful comparison of the types of sources of satisfaction found in the job shows no significant variation from plant to plant. In practically every workman, the sense that he can meet the demands made upon him, that he can do the work readily, constitutes the first and basic source of his pleasure in it. After that, the physical, mental and emotional satisfactions are equally distributed. Men upon the same kind of work do not necessarily, or indeed probably, derive their pleasure in it from the same sources. Where one likes the activity and rhythm involved in his performance, his neighbor doing the same work likes the sense of power over his machine or manifests pride in its performances. A tendency toward more sources among the men of Plants C and D than among those of Plants A and B constitutes the only general distinction.

SATISFACTION IN WORK AND HOURS

But satisfaction in the job not only predominant where skill is utilized, but it apparently is great enough to offset circumstances which might be thought a drawback. The plant where the highest per cent of workmen found satisfaction in the job was also the plant where the highest per cent found satisfaction in the conditions of work. This was Plant C. Yet this plant worked the longest hours of any of the four studied. Ten hours a day were not apparently incompatible with satisfaction in both work and conditions. Undoubtedly other things than the hours of work contributed to satisfaction in conditions. Nevertheless the fact suggests that long hours were not intolerable to these men when the work was skilled.

It becomes a question then whether short hours can be an adequate substitute for interest in work. In Plant B the figures suggest that short hours, along with other conditions, actually became the substitutes for skill in the satisfactions of many men, just as, in Plant A, wages took precedence. The wide range of skill in Plant B, however, makes indications less specific and generalization less safe than for the other plants. The workmen in the upper ranges of the skill-index in Plant B bear out the findings for the men in Plants C and D. In all three plants, where skill comes into play it apparently takes precedence in satisfactions over conditions or wage, even when the last may be a source of active discontent or distress.

SATISFACTION IN SKILL AS AN INCENTIVE TO WORK

Much discussion arises today about incentives to work, their place in developing industrial efficiency, and the various kinds which are effective. Those most frequently suggested involve one form or another of payment or reward: the individual task bonus based on a time study of the job, the group bonus, also based on a careful job analysis, a general high wage, or, profit-sharing and copartnership. All of these are undoubtedly effective when well applied. But the results

of this study suggest that failure to utilize men's capacity for skill development is like failure to utilize the capacity of a waterfall flowing past one's factory doors, or of the coal in one's bins to its fullest extent. It is a waste of a natural utility directly at hand, whose use would be advantageous to everyone concerned.[56]

The keynote of industrial civilization, it has been said repeatedly, lies in its application of power. Until recent years the power developed was primarily mechanical. Today, in order to secure smooth industrial relations between workmen and employers and to attain productive efficiency, increasing attention is being given to human power, especially that of the workman.[57] Philosophers and social psychologists today talk of the drive to power as a primary element in human activity. The development of skill is closely allied to the application of that native driving force. To develop a skill or technique in any line of activity, whether in music, art, sport, or industry, is to harness a torrent of rushing waters and turn it to effective account. Skill is needed in industry today not simply as a bargaining asset for the workman, nor only to supplement mechanical contrivances which have not yet been perfected to the point where they can do the entire work unattended. It is needed as a fundamental psychological requirement of the workman. And it presents a vast resource, which is now only partially exploited, for increasingly efficient production.

The wise engineer will study how to utilize his available resources to their greatest capacity. And the wise student of industrial problems will study how to reveal those resources in the species and in the individual—because in the last analysis human beings must always be considered as individuals—to make possible their adaptation and preservation.

[56] Compare Robert B. Wolf, Use of Non-financial Incentives in Industry, *Journal American Society of Mechanical Engineers*, Dec. 1918. vol. 40, pp. 1035–1038.

[57] Compare H. S. Person, *Bulletin of the Taylor Society*, December 1928, vol. 13, p. 230. Address given before the Taylor Society Meeting.

3. SKILL AND SPECIALIZATION

A COMPARISON OF SPECIALIZATION OF WORK IN THE SELECTED PLANTS

The effect of specialization in industry upon the skill of the workman has been discussed, in general terms, far and wide. But this study has gathered specific data for the purpose of throwing light upon the relation between skill and specialization. A more complete description of the plants and processes studied,[58] which will show their differences in organization, product, and process, becomes necessary at this point.

Plant A

The product of Plant A consists of a variety of size and type of deep-groove ball

[58] A general description of these plants appeared in the June issue of the PERSONNEL JOURNAL.

bearings, the inner and outer races and copper cages for which are turned out at this plant and assembled there with balls from an associated firm. Three types of steel, carbon-chrome, molybdenum and low-carbon steel, are used for the races. Goods are produced for a definite market, mostly on order, from standard designs supplemented by designs made at the plant. During slack seasons some goods of the best selling type are produced for inventory to stabilize employment. The demand tends to be seasonal; February, March, April, and May are peak months, June, July, and August slack months. The average value of the total product per month in 1927 was approximately $400,000. The market extends over the two Americas with occasional orders from Europe and other sections of the world.

Plant A is purely a production plant. Its shop departments are: forging, annealing, bar-turning, automatic-ring-cutting, lathe stamping, hardening, surface-grinding, outside-diameter, inside-diameter and groove-grinding, polishing, assembling and final inspection. It contains in addition a well-equipped laboratory and research department which experiments with and tests out new designs and materials, a fact sigificant for this study only because it indicates that the product is constantly improved in design and material.[59]

Regardless of the constant improvement in designs and methods, processes at Plant A have been standardized to a considerable degree, and standardized products have brought in machinery with many automatic features, some of which have been invented at Plant A or by its allies.

The work required, from shop employees (therefore), is repetitive in nature, the work cycles are short, the skill requirements are supposed to be low. With the exception of tool-making, where an apprenticeship system is conducted in conjunction with the Metal Manufacturers' Association,[60] no training is considered necessary for shop work at Plant A other than that which the workman can readily pick up at his machine on production work. From two weeks to six months are reckoned as enough to bring a man to a point of proficiency, with, in some cases, a longer time for learning to set up the machine for operation. No definite system of promotion exists, and very little promotion occurs. What does occur is based upon merit, reckoned mostly upon output and good workmanship.

Output is the basis of much comparison and judgment at Plant A. Accuracy of work, however, is recognized as an essential element in its production, and careful inspection checks up on this repeatedly.

Plant B

Plant B produces various types of electrical measuring instruments, primarily pyrometers, but other varieties on special order. It manufactures, on order, in part from its own design, in part from designs sent with the order. When orders are low it manufactures somewhat for inventory. The market includes both home and foreign, and the demand is comparatively even. Plant B instruments are outstanding for newness of design and high quality of manufacture.

Little change has occurred at Plant B in recent years in the type of work required. Accuracy of hand and eye are an essential part of nearly every step of instrument making. Such changes as have occurred have tended to increase that requirement to effect an increase in the perfection of the product. By the nature of the product, all emphasis is placed upon accuracy of work not upon output.

Except for the making of certain small, standard parts, automatic machinery has little or no scope here. Certain portions of the regular shop work are comparatively

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[59] No measure of the rapidity of that change was found, nor of its influence upon the work of the shop employees.

[60] The Metal Manufacturers' Association of Philadelphia began, in 1926, a system of apprenticeship in coöperation with the Board of Education, whereby boys are sent to a Trade School for instruction in shop mathematics, mechanical drawing and trade theory, and to metal-manufacturing plants for their shop work. Plant A had three apprentices in its tool-making department during this study.

well standardized so that, while repetitive work is not in order, a noticeable similarity in type of work is required of certain workmen. In addition to the regular shop, a so-called laboratory does the wiring, threading and the like, and an experimental shop builds instruments of a special or experimental type in which one workman makes the entire instrument from start to finish. For this study, selections were made from the regular shop only, as the only department comparable to the light-machine shops of the other plants.[61]

Apprenticeship was at one time unnecessary for Plant B because a skilled type of machinist was available who came already trained from Germany and Austria. In recent years the scarcity of skilled workers has necessitated an apprenticeship system carried on by the plant itself. In coöperation with the Metal Manufacturers' Association,[62] Plant B had at the time of the study 14 apprentices, 9 of whom were in the shop. Shop training is given by each department in turn.

Plant C

The product of Plant C is primarily paper-box machinery, four sizes of wrapping machines and stenciling machines. Two sizes of semi-automatic package-covering machines, an automatic package-covering machine, fillers and printing presses are supplementary. The paper-box machinery, fillers and printing presses are manufactured as standard goods, the package-covering machinery on order. The company does its own designing and experiments continually with new designs. Eighty per cent of the product is of the primary type, twenty per cent supplementary. About 10 per cent of standard goods is manufactured for inventory. This and experimental work are used to stabilize employment. The average value of the product during 1927 was in round numbers $125,000 per month, $1,500,000 during the year.

The market extends over New England, the Atlantic coast and the Middle West. A few orders come from the Pacific coast, England, Australia and Spanish America. The demand is seasonal, reaching its peak in September and October in preparation for the Christmas rush, and its dullest season in June and July.

The inner organization of Plant C is complete on the ground, including its finance, purchase and sales departments. The shop departments consist of milling, engine- and turret-lathe, automatic-screw, cam-cutting and grinding-machine, of drill-press, small assembly, parts-inspection, grinding and polishing, machine-assembly, radial-drill, Ingersol-milling, final-inspection, and castings-painting and grinding.

No great changes in the construction of the machines used at Plant C have been made in recent years or are anticipated in the immediate future. Comparatively little of the work is automatic. Certain automatic machines turn out small standard parts. Automatic stops usable on milling machines and turret lathes, the quick traverse of the turret lathe, automatic-speed and feed controls usable on certain jobs on the milling machines save both the physical and mental energy of the workman. The skill of the all-around machinist is regarded by foremen, however, as essential to the type of machine-shop work turned out. Not output, but good workmanship is stressed. The standard of judgment is one of quality; and the men tend to be proud of quality work.

An apprenticeship system is, and has been for many years, conducted independently by the plant. It included at the time of this study 13 boys in the drill-press, milling-machine, lathe, speed-lathe and pattern departments. Less than eight per cent of the present employees have been so trained however. Few of the trained apprentices have remained in shop work. No other regular training is given shop employees, but promotion occurs occasionally as opportunity offers. The personal knowledge

[61] Two assembly workers from the laboratory were included, but they were not used for comparative purposes.

[62] The employment manager of Plant B had a considerable share in starting the Metal Manufacturers' Association apprenticeship plan. It has been in operation here since September, 1926.

of superintendent, foremen and workmen suffices in so small a shop to arrange all transfers.

Plant D

The product of Plant D consists primarily of all types of power-generating machinery, large and small turbines, condensers, Diesel engines, pumps and jet condensers. Gas engines and auxiliary equipment supplement these. Turbines up to 12,500 kilowatts are manufactured for stock, all above that on order, but the demand for large turbines is expected to increase. Parts for all standard equipment are manufactured for stock, the completed job put together on order. Practically all designs are made by the company engineers, and with constant changes and improvements. The normal value of the yearly output is around 18 million dollars—one and a half millions a month—although the year 1927 averaged only eight hundred thousand a month. The monthly capacity of the plant is reckoned at two million dollars.

The market extends over a large part of the United States, Cuba and Japan. Most of the large power companies of the country use some of Plant D equipment. But the organization of which Plant D is a part has manufacturies in Great Britain which serve the foreign market, and a branch in Cuba as well as other plants in the United States, a total of 15 subsidiary companies. Demand is fluctuating though not seasonal, dependent often upon rush orders.

A complete tabulation of the organization of the factory is not essential for this study. Its shop departments are: pattern-making, foundry, hardening, annealing, blade-shop, heavy-machine-shop, light-machine-shop, assembly and erection, tool-manufacture and supply, testing and inspection. The selections for this study, with the exception of two from the blade shop, come from the light-machine shop which contains engine and turret lathes, drill presses, milling machines and horizontal boring mills.

The type of work and of machines used is rather similar to those of Plant C except that all work tends to be larger, even in the light-machine shop, and orders tend to include a smaller number of pieces. The size of work often makes a considerable difference in the size of the machines. Accuracy and good workmanship are the qualities especially required of the workman. The newer types of machines tend to increase the accuracy possible by an increased variation in speed and feed controls. Certain of the newer machines have automatic features designed to save the workman's energy. Automatic features, however, are not a prominent part of the machinery, nor is it likely that they will increase. A workman must often work upon six or eight different materials in one day, and often does not have the same job to do twice in one week. Changes in design are constant. Adaptability and a good machinist's knowledge, as well as the ability to work closely, are therefore in Plant D an essential part of the workman's craft.

The apprenticeship system here is comparable to that in use in other allied shops of the company and has been carried on for ten years. Apprentices are trained in special departments under special instruction and with up-to-date equipment. No other training is offered and no systematic promotion occurs. Careful records and consideration by management and foremen, however, give considerable scope to capable, ambitious youths.

In the four plants here described there are many likenesses and many unlikenesses. Plant D is several times as large as any of the other three, larger indeed than the three others combined, in capitalization, in plant facilities, in number of employees and in value of output. Its organization is more complex, its production planning more intricate, its personnel policies more impersonal. From the point of view of work to be done, however, the outstanding difference between the plants rests in their type of product, its size, its standardization, and the extent of its market. Plant A is a production plant turning out a

simple product in large quantities and in comparatively little variety. Its work is highly subdivided and repetitive. Plant B is a specialty shop, its product highly intricate, but limited in variety. The work of its machine shops, though requiring accuracy, tends to be specific; the intricacy resides in the assembly of parts rather than in their manufacture.[63] Plants C and D, especially D, make a wider variety of product than either A or B, and with a more limited market for each. Their work tends to be less specialized, more varied, requiring a considerable emphasis on the all-around machinist.

With respect to facilities and services to employees, although there are many individual differences, the plants apparently could be rated as about equal. Policies towards employees and their work are, considering the differences in size of plant and numbers of employees, surprisingly similar. Two of the firms are mildly paternalistic in tendency, while two purposefully avoid any such tendency. But all offer comparable opportunities and attentions to the physical and social well-being of their employees. True, only one firm offers a definite scheme of old-age pensions for long service, but that one, after placing its plant in a new district where ordinary living facilities are scarce, neglects to provide adequately for their employees' everyday physical needs either with proper housing or with a satisfactory cafeteria for mid-day meals. And while, strictly speaking, these two things have no relation and may not counterbalance one another, yet actually in the minds of many workmen they do have weight; the one offsets the loyalty and appreciation aroused by the other. On the whole, these are firms where industrial relations tend to be harmonious and where the idea of mutual service induces both management and men to have a friendly attitude towards one another and towards the public.

The primary differences in the plants, from the point of view of this study, rests, then, in their different degrees of standardization of product, mechanization of process and specialization of work, and on this basis they were selected. An exact measure of the degree of specialization was not found nor is it important. Judging from observation of the variety of product and the size of orders executed, the four plants stood approximately in the relation one to another which the letters assigned to them—A, B, C and D—indicate.

SKILL RATING AND SPECIALIZATION

With this classification of plants in mind, comparison of the workers' skill, indicated both by rating and by index, is striking. The mean skill rating is found to increase consistently from Plant A to Plant D, while for all but Plant B the average deviations from the mean remain about the same.[64] The mean skill-indexes increase likewise. Both rating and index increase with variation required in the work. Nor is this true only of the means for

[63] This study, it is to be remembered, does not touch the experimental and special-instrument work at Plant B, where one man builds an instrument entire, each man an expert in every phase of its manufacture.

[64] Omission of apprentices would have brought Plant B into line.

the entire plant. Between the skill indexes of men operating similar types of machines in the different plants a similar tendency is noticeable. All of the material presented in this study on the evaluation of skill indicates that specialization of work may certainly be associated with lesser skill in the workman.[65]

Though other ratings vary, none varies so exactly according to the specialization of work done as does the skill rating. That upon adjustment to the unusual is significantly the nearest to skill. Here the mean rate increases from Plant A to Plant C, though it drops in Plant D below that in Plant B.[66] But adjustment to the unusual may be regarded as closely allied to one of the main characteristics of skill, its capacity for adaption of response to attain a desired end. The power to adjust or to adapt to varied circumstances or conditions might reasonably be expected to obtain where the need of adaption is inherent in the work done. Moreover the man engaged in repetitive work day after day may very possibly be one who either prefers habitual performance to a varied one or for whom the nature of the work itself has reduced the capacity for change.

The other ratings were discussed previously in relation to skill. Their relation to the degree of specialization in work needs brief comment. The mean rating on habits of work does not vary with specialization—at least the mean of Plant A is equal to that of Plant D. The mean rating on attitude, as the previous section of the article indicated, is lower for Plant A than for the other three, but is nearly alike for Plants B, C and D. The mean rating on relation of men to management increases from Plant A to Plant C, but drops for Plant D. Of all the ratings, only that of skill consistently varies with specialization, although significant variations do appear. Other factors besides specialization influence the ratings of all the characteristics except skill.

AGE, EDUCATION AND SPECIALIZATION

The figures on the education, trade training and trade experience of the men are also striking. The average grade of school attained before work increased from Plant A to plant C with a slight drop in Plant D which, nevertheless, remained considerably higher than Plant A. Trade training tended to be less for Plants A and B and greater for Plants C and D. And trade experience progressed from A to D regularly with the exception of Plant B, where the youth of the selected men obviously influenced the result. With the exception of Plant B the average age of the selected men increased from Plant A to Plant D. The less educated, less trained, less experienced and younger men, in short, tend to the specialized work which is characteristic of Plant A. It is the better educated, better trained, more experienced and older men, on the whole, who do the more skilled and the less specialized work which is characteristic of Plants C and D.

[65] See Table I, in June issue of the PERSONNEL JOURNAL. See also Table VII in Appendix D.

[66] The frequent requirement of overtime and night work influenced adversely the attitude of workmen at Plant D.

WAGE AND SPECIALIZATION

The wage of the workman, does not apparently vary exactly with specialization of the work required. The average wage in Plant A is approximately the same as that in Plant C, and while the wage in Plant D averages considerably higher than in Plant A, any difference in degree of specialization of work and skill of the workman between Plant C and Plant D is not great enough to explain such difference in wage. In this connection, it should be remembered that whereas the men of Plant A were fairly contented with their wages, as were the men of Plant D, those of Plant C were less contented with theirs. Quite possibly a larger number of cases covering more factories would show a definite relation between specialization and wage as between factories. The lower rate of wages of both Plants B and C may not be typical of the market as a whole. Obviously it shows that the work is not alone the determinant of wages, that conditions of work or type of management may enter the reckoning and become in part a substitute for wage. But that conjecture is scarcely a new one, and more than conjecture the facts here ascertained do not warrant.

SATISFACTION AND SPECIALIZATION

Finally the discussion of the last section showed that satisfaction in work belonged predominantly to workmen using a fairly high degree of skill, and to the less skilled men only when their capacities and experience had not made them conscious of superiority to their work. If these findings are typical, obviously the relation of satisfaction and specialization which reduces the degree of skill required needs little further discussion. The workman's satisfaction, if it could be measured, would not necessarily decrease with the increase of specialization; differences in capacity would probably vitiate any such exact relations. But the need to suit capacity to work, or vice versa, stands out in high relief.

THE ELEMENTS OF SKILL UNDER SPECIALIZATION

One other comparison should be made between the specialization of the work and the skill of the workman. And that is the comparison of the different elements making up the skill which the workmen in the different plants exhibit.

The skill analysis named certain skill-factors of which the workman's skill consisted; the average number of these, occurring per therblig in an operation, composed the therblig-skill-average. These skill-factors consisted of adaptation to machine, materials, tools, accuacy of movement, motion saving, adaptation of energy to need and the rest.[67] A comparison of the average number of each of these skill factors per therblig, as shown in the total operations on each machine in each plant, in other words, the detail of the factors making up the therblig-skill-average of all workmen of each machine is illuminating. Table XIII gives the figures.

Within the shop, as the table shows, the differences from machine to machine were largely in the extent to

[67] See Part I of this article in June issue of the PERSONNEL JOURNAL.

which each skill-factor was used. Approximately the same skill-factors were utilized by all workmen. Moreover, the variation seems to be well distributed. The higher therblig-skill-average tends in comparison with others of the same shop, to be composed of a larger number of skill units throughout. For example, with a certain few exceptions, the most obvious of which is assembly in Plant B, the work requiring in its performer a greater amount of adaptation to machine, required also a greater amount of adaptation to materials and tools. Self-confidence alone did not at all follow the rule.

Between shops the comparison is quite otherwise. The variation which occurs is not only that of amount but tends also to be that of kind. And the greater number of types are used in the less specialized shops. Adapatation to materials, for example, belonged much more prominently to the workmen at Plants B, C and D than to workmen at Plant A; adaptation to tools belonged especially to Plants C and D as did also plan, aside from its use by assembly men in Plant B; accuracy of movement was outstanding with workmen at Plant B.[68]

The conclusion from all of the evidence is that a definite and determinable reduction of the skill required occurs in accordance with the degree of specialization of work. In still more highly specialized work than any represented in this study, a greater elimination should certainly be expected, and in some cases, perhaps its practical disappearance. The dexterity which at most would be required could hardly be dignified by the name of skill.

CLASSIFICATION OF PLANTS AND PEAR'S CLASSIFICATION OF SKILL

Still another basis for studying these plants is suggested by Pear's classification of skill given in the opening discussion of this report.[69] Three of its five grades, he claims, include most of industrial skill today: (a) skill manifested solely in an habitual response, (b) skill exhibiting an habitual response plus a certain minimum of adaptation, and (c) skill utilizing habit but with adaptations expressing the individuality and style of the performer. Much of the selected work of Plant A, must be classified as requiring the first of these three grades of

[68] Some variation is due to charting by different investigators. Some also may be due to the difficulty of distinguishing the types of skill-factors; it is sometimes easier to detect skill than the kind of skill. There is a tendency, therefore, in some of the charts to confuse motion saving with adaption of energy to need, and sensitivity of touch with kinaesthetic sensitivity. Obviously the definitions and limits of each should be more objectively developed. Undoubtedly also skill charting itself requires a skill of its own. These questions, however, do not at all destroy the evidence which the table presents.

There is also, without doubt, a difference in skill-factors as used on different machines and in different plants which is not apparent in the figures given. This may be a difference in amount or in type. If it could be determined, it would probably increase the variations shown, but there is no reason to suppose that it would alter at all the nature of the comparisons either within or between the plants.

[69] See June issue of the PERSONNEL JOURNAL.

skill. It was largely habitual performance, even though the habits did require some weeks of training for their perfection—possibly more if the workman had had no previous machine-shop experience. The selected work of Plants C and D, on the other hand, was mostly of the kind requiring the last of these grades of skill. It required a constant habit adaptation and one which ordinarily was highly individual with the performer.

The selected work of Plant B included skill requirements from all three of the grades so that Plant B may not be properly counted an example of a plant using primarily the second grade. Undoubtedly such plants exist. Plant B, as it happens, represented a particularized trade of instrument-making, not so comparable, perhaps, to the other three plants as the latter to each other. It contained within itself nearly the whole range of specialized and unspecialized work. Certain of the selected work at Plant B, however, came nearer to requiring the second of these grades of skill than any in Plants C or D or than most in Plant A, where newer types of machines were in use.

The conclusion seems justified, that on whatever basis the skill of the workmen in the four plants is compared, it will be found to graduate from one plant to another in a regular and determinable fashion. A study of the skill ratings, of the skill-indexes, of the skill-factors, forming therblig-skill-averages, and of the grades of skill as classified by Pear, indicates a definite variation from plant to plant which can be analyzed and classified.

INTER-FACTORY PROMOTION

The revelations of this study fortify the plan already urged that promotion between manufacturing plants within an industry be developed, both for the good of the industry and the good of the workmen.[70] The gradation of the skill-index and the variation in use of the different skill-factors is most telling evidence that for the use of the workmen's resources such promotion might be valuable and practicable. And at the same time it supplies the necessary method and technique by which such a system of promotion could be developed. The system should be valuable enough, both to the industry and to the workmen, to make experimentation thoroughly worth the time, trouble and risk, if any, involved. A discussion of the need and practicability of the scheme may be useful.

The suggestion of an inter-factory promotion system and the basis indicated for its development does not intend to be an *ipso facto* indictment of repetitive work as such. The returns of this study have not proved that such an indictment is justified. Repetitive work, at present, seems to be satisfactory to and probably desirable for some workmen who might never reach a similar degree of success in work requiring greater skill capacity or development. Industry is to be congratulated on utilizing such men so effectively. Undoubtedly there is a gradation in men's powers of development as there is a gradation in men's

[70] See especially Anne Bezanson, Promotion from Without, *Quarterly Journal of Economics*, 1921–22, Vol. 36. p.154.

native capacities. The various intelligence and motor tests have shown the latter certainly. Whether or not one looks upon the industrial use of repetitive work as designed to aggravate and intensify those native differences, the great immediate waste in human resource and productive efficiency comes, in keeping at repetitive work, men who have capacities superior to it. Inter-plant promotion might do much to eliminate such waste.

Actually at the present time such a movement of workmen does take place to some extent. This study shows it. Miss Bezanson[71] has especially well pointed out the function of the changes which the workmen themselves make through the movements of labor turnover. Men without an apprentice training, and even men with it, get both training and experience by moving from plant to plant. Practically all of the seventy-five men in this study had experimented with such changes and looked upon them as an essential part of their industrial life. Many of those who at the time of the study were discontented with their work spoke of the desirability of changing it, but hesitated to attempt it, often because of the risk entailed for families and dependents.

The suggestion of an inter-factory promotion system, if carried out, probably would involve little additional movement of labor. It would, rather, regulate the haphazard character of the present method of movement and eliminate many of its evils in risk and waste for both workmen and industry. For there can be no question but that the present turnover methods are wasteful, both of the energies and earnings of the workmen and of the production planning and wage cost of the management. Organized promotion by this method, based on scientific knowledge of the workmen's skill, might remove a large share of such waste.

The question arises as to whether such promotion would be advantageous to all grades of an industry. Certain factories would tend to serve as training fields for others requiring a higher grade of skill. Might that tendency increase the labor problem for those requiring the lower grades? Undoubtedly it would do so if those factories possess a stable and efficient labor force at present. But the tendency now seems to be for the workmen in such plants to change frequently under present conditions. Those who remain with satisfaction under the present method would in all probability remain under the new one. Those who remain without satisfaction, solely under the drive of economic necessity, may in some cases be as efficient as the standard requires, but are often a source of difficulty and unrest. The opportunity for promotion might of itself prove psychologically beneficial. Moreover, the workmen in Plant A of this study already tended to be younger, less experienced and less trained, as well as less skilled, than those of Plants C and D. No alteration in that relation would take place. The alteration which would occur for Plant A, and possibly even more so for plants requiring less skill than Plant A, would be largely an improvement in morale, a morale built upon

[71] Anne Bezanson. Previous citation.

satisfaction in work as well as upon wage and plant loyalty. And the saving due to a planned-for rather than to a completely haphazard system of labor turnover would be as great for the plants requiring the lower skill grades as for the others.

It is not suggested that the scheme would be a simple one to develop effectively. It would require careful job analysis and skill analysis to make possible any adequate grading of plants. It would require tact and consideration to make the scheme efficient once it was established. Job incentive has shown itself primary for the selected workman of this study, but wage incentive and the incentives arising from conditions of work, both physical and social, were not by any means negligible. Failure to consider either of these might readily counteract the advantage gained from the first. But difficulties are not unsurmountable. The evil of the waste the plan aims to eliminate is sufficient to recommend its consideration.

DESPECIALIZATION AND MECHANIZATION AS ALTERNATIVES

Another alternative is being tried in certain places today, discussion of which is coming slowly to the fore. That is the movement toward despecialization of production and of work. The movement toward specialization and mass production has in certain instances overstepped the bounds of industrial efficiency, and either the exigencies of the market or the wastes of a too fine and overlapping division of labor have turned the course back toward a lesser and more carefully studied type of specialization. The struggle has been keen between the advantages of mass production and the requirements of intensive marketing cultivating an ever-increasing demand for standard goods. Under the failure of that demand, mass production has over-reached its limits. The result has been a necessary withdrawal, a compromise between the competing forces, namely, "merchandised production," that is, production based on a carefully studied and estimated market and varied in accordance with its changing tastes.[72] How much that variation will affect the specialization of work and the skill of the workman, it is difficult to say.

At the same time there are instances, some of them on a large scale, where work has been thought too specialized for a proper utilization of the capacities of the workmen, and a policy of deliberate despecialization has been substituted. In at least one large center of a great telephone manufacturing company, the work of installing, testing and repairing, which a few years ago was divided among three men, has now been transferred to one man who is trained in turn in all three tasks. This has been done first, to make him a more efficient producer on any one of them, and second, to make possible his employment in the three kinds of work when the need arises. The initial experiment has proved successful and its further application is being undertaken in other centers.

Despecialization, however, has oc-

[72] See for example, Paul M. Mauzr, *American Prosperity, Its Causes and Consequences.* New York: Viking Press, 1928. p. 130.

curred so far only where special circumstances or an extreme development of specialization had made it necessary. For the present a large degree of specialization, certainly as much as this study has investigated, seems to be sound in basis and established in fact. To increase the efficiency of this existing and working organization of industry and to offset its disadvantages, the engineer needs every facility and assistance.

Quite as likely as the despecialization of industry is the complete mechanization of industry which may some day abolish the repetitive task of the machine tender, and, on a new scale, may capitalize the highly skilled workman. The expectation of such development has occurred to more than one student and observer of industrial history and progress. The time may very possibly come, when the power-driven and electrically-controlled machine will do all the heavy and monotonous work of mankind. The control of the machine and its maintenance only will depend upon human labor, a labor which will necessarily require thorough training and a comparatively high degree of knowledge for its performance. The nature of skill under such conditions might become completely altered and, for production purposes at least, the technique of the engineer supersede the manual dexterity and kinaesthetic knowledge of the machinist.[73]

That time, if it is ever to arrive, is still far in the distance. The first and immediate concern of the sociologist, psychologist and industrial engineer is the use of existing resources under existing conditions. A wise and far-sighted application to that task will assist, not impede, future development.

[73] Compare John R. Commons, *Industrial Goodwill*, New York: McGraw, 1919 and Stuart Chase. Men and Machines. *The New Republic*, March 1929, vol. 58, pp. 61–65.

4. THE NATURE OF SKILL AND ITS NOTATION: A CONCLUSION

The material presented has shown the wide range of skill needed by workmen within a single trade doing comparable kinds of work. It has demonstrated the possibility of evaluating that skill, and has provided a method for doing so. The results lead one to ask what the discussion has contributed toward a knowledge of the character of skill itself.

THE DEFINITION IN THEORY AND PRACTICE

The definition of skill, used as the basis for study, was *the integration of well-adjusted performances*. Habitual action and the adaption of habitual action to effect a specific result were regarded as its essential and primary characteristics. Unquestionably the analysis and its results have corroborated the definition. In all of the skill studied, its essence has seemed to consist of the integration of adjusted performance. And the discovery of the various grades of skill has emphasized, first, the habitual characteristics and second, the adjustment characteristics involved in skill development, with the latter increasing proportionately with the increase of skill attained.

Indeed the essence of the higher

grades of skill and their chief differentiation from the lower grades has seemed to lie in the degree of adjustment ability which the workmen reached. For example, in the comparatively simple operations of Plant A, where the work was almost entirely repetitive, the workman learned to handle his machine readily and habitually. He learned how to set it, to turn, bore, or grind a specific material—perhaps three materials—into a specific form with, at most, variations in size which it required certain adjustments of his machine to accomplish, adjustments which he became accustomed to handle. He learned a definite order of procedure in his operation and the time required for its performance, through which he proceeded with complete self-confidence. He knew his machine, he knew his operation, knew them intellectually perhaps, knew them kinaesthetically certainly. Each muscular contraction called for its following contraction with perfect precision.

In the learning process he had developed certain habits of response to certain stimuli. The development had called for certain adjustments in muscular activity and response and it had required an integration of those adjustments. The process went on for some time after he was considered trained, probably, and for some months, perhaps, he improved the precision, perfection and speed of his performance. But, according to most of the workmen studied in Plant A, there came a time after which there was no more improvement in performance. From that time on the actions were habitual and for the most part set. The description does not apply to all of the workmen studied in Plant A. In all of the plants there was variation. But for most of the workmen in Plant A, the variation of response required after the learning period was passed was extremely limited, at least in the operation of the machines.[74]

In the more complex and varied work of Plants C and D the requirements were quite different. Adaptation to his machine and self-confidence in his procedure were no less important with the workman in Plants C and D than with the one in Plant A, but were rather more so; he learned to handle his machine with quite as much assurance. But he learned as well to adapt it to various materials and to use upon it a variety of tools calculated to perform a variety of operations. He learned to plan a varied and intricate procedure and to integrate the whole to produce a no less accurately and precisely worked product. His increased ability to adapt his performance to a varied requirement proved to be the essence of his greater skill attainment.

"ACCIDENT" AND "PROPRIA" ELEMENTS IN SKILL

But there may be question as to the analysis of skill developed and the characteristics of workmanship which were included among the skill-factors. Pear[75] has divided skill into what he terms its "accident" and "propria"

[74] In their set-up, the needed variation was somewhat greater, as the therblig-skill-average indicated.

[75] T. H. Pear. The Nature of Skill. *Journal of National Institute of Industrial Psychology*, Oct. 1928, vol. 4, pp. 193–202.

elements. Under the former he lists the sensitivities, that is, the discriminatory powers, and the knowledge used. These seemed to him basic to skill development, but not a part of its essence. The essence, i.e., the propria element, he places in the muscular coördinations. This study has grouped these elements together. Their separation has seemed to the writer logical but not practical. From the point of view of skill there is no separation other than a logical one between the trained muscle and its functioning, or between a trained power of discrimination and its response to its given stimulus. The possession of the native structure may indeed be an accident factor in skill development; but the possession of a trained and developed structure is a part of its essence. And it includes the whole of the organism which is an integral part of the functioning. The knowledges and developed sensitivities, therefore, are as essential a part of a skill performance as the muscular activities themselves. The vital element is that they shall all have a muscular expression which is itself the integration of all the functioning which the organism employs to produce a desired result.

Pear's distinction between accident and propria elements in skill and his apparent tendency to exclude from the latter all but the muscular coördination which immediately precedes the result may be based in part upon the distinction made in various investigations between sensory discrimination and a skilled performance which is apparently allied. An example is the low correlation found by Seashore[76] between sensitivity of ear to pitch, at a physiological limit, and musical skill Obviously the correlation between any general sense perception and a skill which plainly utilizes that sense organ might be extremely low unless the discriminatory power tested were actually one used in the skill performance. And for much musical performance a rather wide variation in accuracy of pitch is plainly permissible. According to Seashore, however, the cognitive element in sensory discrimination does, with training, improve the use of a given power. In any developed skill also a discriminatory power which is used is one trained to a particular function, whatever the native capacities of the organ concerned. In this study, consequently, sensitivity of eye and ear are, more exactly, the adaptation of eye or ear to discriminate in relation to a particular performance. Upon that basis the writer claims that the developed sensitivities, as well as the intellectual and kinaesthetic knowledge which direct the muscular coördination of which the performance consists, are an essential part of the performer's skill.

Nor are they the less essential because they are not always the same for all performers. Some of the operations selected for this study required a particular ability to be developed, an ear trained, for example, to detect a particular hum which indicated a particular condition or relation in the performance, necessary because it was the only method of detection possible. But most operations allowed a variety

[76] Carl E. Seashore, *The Psychology of Musical Talent*, Boston: Silver, Burdett & Co., 1919, Chapter II. This is quoted by T. H. Pear, in Skill. JOURNAL OF PERSONNEL RESEARCH, April 1927, vol. 5, no. 12, p. 486.

of abilities. What one workman detected by a specific hum, another detected by a specific vibration in his wrist or forearm, and still another by both methods in conjunctiom. The study demonstrated that the last tended to be the most skillful workman, but it was not invariably so. The variety of methods used and permissible did not make the act of detection any the less an essential part of the performance.

KINAESTHETIC AND SENSE KNOWLEDGE IN SKILL

One conclusion seems inevitable, however one looks upon the above discussion. By the nature of skill, it is apparently a kinaesthetic and sense knowledge which forms the basis of the power of adjustment and adaptation.

Just how that kinaesthetic and sense knowledge is attained is less certain. It is usually assumed that it can only be by kinaesthetic and sense practice, if one may use such terms.[77] Yet recent apprenticeship methods in the metal trades are tending to increase the amount of schoolroom work, i.e., shop mathematics, mechanical drawing and principles of mechanics, given to the apprentice, not so much to increase his knowledge of his trade over that of his predecessors, as to supplement his shop experience. The expectation is that he will translate the knowledge acquired in the schoolroom into his practical work at the bench or machine. Knowledge of materials, for example, at least of the three basic ones, must be for any skilled machinist a kinaesthetic knowledge of the speeds and feeds which he may use to work the materials, whatever his theoretical knowledge of their strength and resistance. Even if the practical work of the present-day apprentice is more limited in scope than that of his predecessor of a generation ago, the theory of the system assumes a translatable element from the theoretical to the practical field. The assumption has not yet been proved conclusively. Much more experimental work needs to be done on the subject to satisfy the scientific observer. But there may well be intellectual shortcuts to kinaesthetic skill attainment.

[77] Compare W. F. Book, *The Psychology of Skill*, New York: Gregg, 1925.

ACCURACY IN INDUSTRIAL SKILL TO-DAY

At least one quality in industrial skill attainment, namely accuracy, was not analysed closely enough in the course of this study. In all of the plants, accuracy of movement ranked high among the skill-factors charted. Especially in Plant B, it played a striking part. But knowledge of the plants leads the writer to believe that accuracy not only should predominate still more in the skill of the workmen of Plant B, but that in the skill shown at Plant A also it should appear as more significant. Probably in all the plants, accuracy was a larger element in the skill required than the charting indicated.

The fault lies in the lack of a technique, as yet, for measuring the degree of any one skill-factor entering into skill. The point demonstrates a very subtle distinction, inherent in the nature of skill, between the amount of skill and the extent of it involved in

any performance. It is possible to analyse any activity and to point out the parts of it and the movements when skill is in play; but it is not yet possible to say how much skill is in play at any given moment. So, though one may count the exhibitions of skill in a performance and get an evaluation of it in comparison with other performances of its kind, one may not yet get an actual measure. A new and more carefully considered analysis of skill is needed.

MOVEMENT AND TIME IN SKILL NOTATION

The method attempted in this study has been the detection of skill and its evaluation in terms of movements. The evaluation might well have been done in terms of time. Once the skill was detected, the average skill used by a workman in a specific time interval might have served as the unit of measure. The index would then have been quite as easily computed. This was not done for several reasons. In the first place, the attitude of the workman toward the stop watch seemed to preclude the use by the investigator of any such means of time notation, and the expense of micro-motion films made it prohibitive on a large scale. Secondly, the essence of the workman's skill seemed more vitally associated with his movement than with the time involved in it. Merely to note time involved might seem also to neglect the qualities necessary to good work. The use of the therblig as a unit of uniform length regardless of time was a daring venture, but one which the results have fairly well shown to be justified and sound.

Experiments were made with simo-skill-charts on a time basis, however, in all of the selected plants. At least two moving pictures were taken of certain of the selected operations in each plant according to the Gilbreth method whereby time was measured in terms of "winks" or one two-thousandth of a minute. The films were analysed under slow-motion scrutiny, and simo-skill-charts made which yielded a wink-skill-average comparable to the therblig-skill-average for each workman filmed.

The pictures were taken for experimental purposes only but they yielded two important results. They demonstrated the accuracy of the movement observation and the process charting already done, and they produced a limited opportunity for comparison between the two methods of skill evaluation. The first point speaks for itself; the second needs further illumination.

On most of the operations selected it was found that the two averages were surprisingly alike and that the variations between them were comparable.[78] Upon certain operations where one part of the performance continued for an extended time—either a long period of a specific work movement or a long period of waiting, in either of which the therblig of uniform length would have counted as a unit in terms of movement regardless of the time consumed in its performance—upon such

[78] Films were made of operators upon an I. D. grinder and an engine lathe at Plant A, upon two engraving machines at Plant B, upon a milling machine and a turret lathe at Plant C, and upon a drill press and a turret lathe at Plant D.

operations, the therblig-skill-average and the wink-skill-average differed in accordance with the proportion of the whole time of the operation occupied by the extended portion. The engraving operations and the selected milling operation proved to be of this type, though the set-up of the engraving machine pictured was not of this type.

Enough films of a kind were not made to test out the skill index variation if calculated on a time unit. But the indications were that, upon the same work at least, it would be comparable to that found by using the therblig unit. Further research would be necessary to produce decisive results.

On the whole the writer inclines toward the view that for the high skills at least, such as those observed in this study, movement is the most vital element in skill notation, whether or not the time occupied in the movement is included.[79]

THE THERBLIG IN SKILL NOTATION

The prime criticism which rises concerning the method used in this study centers chiefly around the Therblig. The basis of movement notation used has been the therblig; and the therblig, while excellent for the job analysis for which it was developed, in its present form is not specific enough for skill analysis. A much more detailed and keenly divided movement notation is needed to discover a unit of movement accurately fitted to the study of skill and conducive to its true measurement, a notation which shall be both detailed and flexible.[80] The essence of any motor skill must certainly be in the relation of the functioning of the various muscles and sense organs involved in its performance. To discover and to analyse any such relation will require a perfected technique of movement notation, and much further research. More accurate analysis of skill might probably follow. The understanding of skill is indeed in its infancy.

But the study of certain workmen in the four plants here described has revealed a fruitful and original attack. However crude the investigation may seem, however inexact its method, and however limited its number of cases, it has developed a means of skill evaluation which both opens the door to new ventures and in itself produces surprisingly telling results. A method which detects, as this one does, not only differences in skill used by different workmen but differences in the skill of the same workman, on different occasions, both in accordance with the specific work done and in accordance, apparently, with some factor within the workman such as his mood and condition, has gone far enough to be immediately useful. When it has obtained an evaluation of industrial skill which will stand even the tests levelled at it in this study, it has attained much practical value. Indeed, in spite of its faults, and no one appre-

[79] Probably both are integral in different spheres of activity. Experimentation may later analyse and compare them. Compare Frank B. Gilbreth, *The Laws of Motion Economy*, on the relation of the therblig to skill.

[80] Compare F. M. Earle, *Occupational Analysis*, National Institute of Industrial Psychology, Report No. 1, for a method which is detailed but not flexible.

ciates more keenly than the persons associated with the study its limitations at every stage of its development, it has succeeded in suggesting a number of relationships which, if not proved, are at least extremely interesting as evidence. And it has opened the door for further research. One study is being made at the present time. Annie Shaw, who served as one of the investigators in this research and who helped to develop its technique, has continued the attempt to detect and to analyse skill as it is exhibited in certain industrial performances. Her attack was a new one, and it is hoped that it has found a more completely objective method of evaluating skill attainment.

SKILL IN THE FUTURE INDUSTRIAL DEVELOPMENT

The significance of skill in modern industrial development is certainly not a new subject for thought. The vast changes in industrial organization and processes which are being constantly introduced have been frequently discussed. They have been described more than once as comparable to the revolution of a hundred years ago and the introduction of the factory system. A description of what is happening is vital. But no less vital is the significance of the developments and of their effects upon production, upon the life and personality of the producer, and upon social organization.

There is a trite statement that knowledge is power. Akin to it but less exploited is the realization that skill is power. If prophecies about mechanization prove correct and automatic machinery becomes prevalent, the skilled workman may in most cases be displaced by the technician. It would be easy to question the expectation of that event on the basis of existing facts; the present use of skill is probably greater by far than many persons realize. But assuming the trend of industry to-day to be toward such development, skill may become divorced from technique as, in the last century or so, art has tended to become divorced from technique. The time was when art was an integral part of many of the crafts, and the workman, who had the capacity to become so, might be artist as well as artisan. To-day, for most of humanity in industrial civilization, art has become a spiritual and aesthetic force tending to belong primarily to the realm of leisure. So the time may come when skill will follow a similar road. The arts and sports are still tremendous fields for the development and display of skill, but it is a grave question whether industry can afford to dispense with it as a non-essential, or, for its purposes, an inferior factor. Skill may be a primary source of power and satisfaction in the working life of the individual. Will that power and satisfaction proceed as well from the spread of technique? Or is there, for many people, value in trained kinaesthetic activity which intellectual functioning could not replace? If such value exists, does it belong only to the individual, that is, is it a psychological problem primarily? Or is industry in danger of casting off one source of power without reckoning whether there exists, or will exist, enough of the other to fill its needs?

The questions are unlimited. The essence of all of them shows the need

for study of the nature of this phenomenon so vital to man's development up to the present time—his skill capacities and accomplishments and their significance to himself and to the new evolution of his social and industrial techniques. The answer depends equally upon the industrial engineer, the psychologist and the sociologist, and upon their coöperation.

APPENDIX D*

TABLE IV

A summary of correlations, including probable errors, between skill-indexes and other factors. Four plants

Correlations using unit intervals based on Pearson's formula: $r = \frac{\Sigma x y}{N \sigma_x \sigma_y} \pm .6745 \frac{(1-r^2)}{\sqrt{N}}$

CHARACTERISTICS OF THE WORKMEN	S.I.1		S.I.2		S.I.3	
	r	P.E.	r	P.E.	r	P.E.
Plant A						
Production standing	.17	±.14	.10	±.15	−.11	±.15
Skill rating	—	—	—	—	.28	±.14
Habits of work	—	—	−.27	±.13	−.26	±.13
Attitude to work	—	—	.23	±.13	.24	±.14
Relation to management	—	—	.18	±.14	—	—
Education	—	—	−.29	±.12	—	—
Trade training	—	—	−.02	±.14	—	—
Wage	—	—	−.00	—	—	—
Plant B						
Production standing	.73	±.08	.79	±.06	.79	±.08
Skill rating	—	—	—	—	.91	±.03
Habits of work	—	—	.56	±.12	.65	±.12
Attitude to work	—	—	.48	±.13	.59	±.13
Relation to management	—	—	−.03	±.17	—	—
Education	—	—	.18	±.16	—	—
Trade training	—	—	−.16	±.13	—	—
Wage	—	—	.46	±.14	.73	±.10
Plant C						
Production standing	.72	±.10	.77	±.08	.80	±.09
Skill rating	—	—	—	—	.65	±.12
Habits of work	—	—	.63	±.11	.66	±.12
Attitude to work	—	—	.79	±.08	.71	±.10
Relation to management	—	—	.17	±.21	—	—
Education	—	—	−.22	±.20	—	—
Trade training	—	—	.31	±.01	—	—
Wage	—	—	.52	±.19	.76	±.11
Plant D						
Production standing	.51	±.11	.67	±.08	.66	±.08
Skill rating	—	—	—	—	.05	±.15
Habits of work	—	—	−.33	±.13	−.29	±.40
Attitude to work	—	—	−.13	±.15	−.11	±.15
Relation to management	—	—	−.32	±.13	—	—
Education	—	—	.56	±.13	—	—
Trade training	—	—	−.04	±.13	—	—
Wage	—	—	.35	±.15	.37	±.14

* Appendices A to C were given in Part I, in the June number.

TABLE V

Age of workmen

AGE IN YEARS	TOTAL	PLANTS			
		A	B	C	D
Total	75	27	15	11	22
Under 25	11	4	7	—	—
25 to 35	33	12	7	6	8
35 to 45	22	9	1	3	9
Over 45	7	1	—	1	5
Not listed	2	1	—	1	—
Mean age	33.4	32.7	26	35	38.6
Average deviation	7.1	6.4	5.6	6.0	6.3

TABLE VI

Production standing of selected workmen

PRODUCTION GRADE	TOTAL	PLANTS			
		A	B	C	D
Total	75	27	15	11	22
A	41	15	7	5	14
B	23	10	4	4	5
C	5	—	2	1	2
Not listed	6	2	2	1	1

TABLE VII

Rating of skill of selected workmen

SKILL RATING	TOTAL	PLANTS			
		A	B	C	D
Total rating					
Total	71	24	15	10	22
20 to 30	*4*	*3*	*1*	—	—
30 to 40	*12*	*10*	*2*	—	—
40 to 50	*11*	*9*	*2*	—	—
50 to 60	*8*	*1*	*4*	*1*	*2*
60 to 70	*5*	*1*	*1*	*2*	*1*
70 to 80	*11*	—	*1*	*3*	*7*
80 to 90	*15*	—	*4*	*2*	*9*
90 to 100	*5*	—	—	*2*	*3*
Mean	61.3	39.6	59.0	77.0	79.5
Average deviation	19.5	7.5	16.8	10.4	8.7

TABLE VII—*Concluded*

SKILL RATING	TOTAL	PLANTS			
		A	B	C	D
Technical rating					
Total	71	24	15	10	22
1 to 10	*15*	*12*	*3*	—	—
10 to 20	*16*	*10*	*6*	—	—
20 to 30	*22*	*2*	*1*	*5*	*14*
30 to 40	*18*	—	*5*	*5*	*8*
Mean	21.0	10.6	20.3	31.0	28.9
Average deviation	9.5	5.8	10.4	5.0	4.7
Manual rating					
Total	71	24	15	10	22
7 to 12	*15*	*7*	*5*	*1*	*2*
12 to 17	*31*	*15*	*5*	*2*	*9*
17 to 21	*25*	*2*	*5*	*7*	*11*
Mean	15.2	13.7	14.5	17.5	16.5
Average deviation	3.0	2.3	3.3	2.8	2.9
Sensitivity rating					
Total	71	24	15	10	22
1 to 3	*6*	*3*	*3*	—	—
3 to 6	*29*	*20*	*5*	*3*	*1*
6 to 9	*36*	*1*	*7*	*7*	*21*
Mean	6.3	4.7	5.8	7.1	7.8
Average deviation	1.7	.7	2.0	1.3	.3
Personality rating					
Total	71	24	15	10	22
1 to 10	*13*	*12*	*1*	—	—
10 to 20	*22*	*11*	*7*	*2*	*2*
20 to 30	*35*	*1*	*7*	*8*	*19*
Not given	*1*	—	—	—	*1*
Mean	18.1	10.4	19.0	23.0	24.0
Average deviation	6.8	5.4	3.6	3.2	1.8

TABLE VIII

*Ratings of selected workmen in four plants**

RATINGS	TOTAL	PLANTS			
		A	B	C	D
Habits of work					
Total rating	75	27	15	11	22
25 to 50	—	—	—	—	—
50 to 75	11	3	4	2	2
75 to 100	62	23	11	8	20
Not given	2	1	—	1	—
Mean	—	90.6	87	88	91.3
Standard deviation	—	9.7	12.9	12.15	8.1
Adjustment to unusual in work					
Total rating	75	27	15	11	22
25 to 50	23	14	2	3	4
50 to 75	25	5	2	3	15
75 to 100	13	5	2	4	2
Not given	14	3	9	1	1
Mean	58.4	53	62.5	65	60
Average deviation	15.7	18.2	16.6	18.0	18.7
Attitude toward work					
Total ratings	75	27	15	11	22
25 to 50	6	6	—	—	—
50 to 75	28	15	3	3	7
75 to 100	38	4	12	7	15
Not given	3	2	—	1	—
Mean	—	63.5	80	82.7	84.3
Standard deviation	—	14.4	11.75	7.4	11.2
Attitude toward management					
Total ratings	75	27	15	11	22
25 to 50	7	6	1	—	—
50 to 75	19	5	5	—	9
75 to 100	45	13	9	10	13
Not given	4	3	—	1	—
Mean	—	75.5	77	97.8	84.3
Standard deviation	—	26.6	16.9	5.7	15.4

* Averages based on unit scores, except for adjustment to unusual.

TABLE IX

Grade at which workmen left school

GRADE COMPLETED	TOTAL	PLANTS			
		A	B	C	D
Total	75	27	15	11	22
Grade school, total	36	20	3	5	8
Fifth	*1*	*1*	—	—	—
Sixth	*4*	*4*	—	—	—
Seventh	*8*	*4*	*2*	—	*2*
Eighth	*23*	*11*	*1*	*5*	*6*
High school, total	21	4	5	5	7
Partial	*16*	*4*	*4*	*2*	*6*
Complete	*5*	—	*1*	*3*	*1*
University	1	1	—	—	—
Not listed	17	2	7	1	7
Mean grade	8.7	7.6	9.25	9.6	8.9
Average deviation	1.6	1.3	1.4	1.6	1.3

TABLE X

Trade training of workmen

TRADE TRAINING RECEIVED	TOTAL	PLANTS			
		A	B	C	D
Total	75	27	15	11	22
No training	34	11	10	3	10
Trade apprentice	25	5	3*	6	11
Partial	*9*	*2*	*3**	—	*4*
Complete	*16*	*3*	—	*6*	*7*
Other system	4	2	—	1	1
Other trade apprentice	9	8	1	—	—
Not listed	3	1	1	1	—

* In process.

TABLE XI

Average weekly wage (selected period, 1927)

WEEKLY WAGE EARNED	TOTAL	PLANTS			
		A	B	C	D
Total	75	27	15	11	22
$15 to $20	3	—	3	—	—
$20 to $25	2	—	2	—	—
$25 to $30	7	1	5	1	—
$30 to $35	12	8	2	—	2
$35 to $40	20	7	2	4	7
$40 to $45	16	8	—	1	7
$45 to $50	6	1	—	1	4
$50 to $55	0	—	—	—	1
$55 to $60	2	—	—	—	2
Not listed	—	2	1	4	—
Mean wage*	—	$37.92	$27.28	$37.00	$42.11
Average deviation	—	3.93	5.20	4.00	$4.13

* Averages are based on unit scores.

TABLE XII

Satisfactions of selected workmen, in job, wage and conditions of work

GRADE OF SATISFACTION SOURCES*	TOTAL	WORKMEN IN PLANTS							
		A		B		C		D	
		Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent
Satisfactions of selected workmen on the job									
Total	75	27	100	15	100	11	100	22	100
A	35	3	11	5	33	10	91	17	77
B	13	7	26	4	27	—	—	2	9
C	20	14	52	5	33	—	—	1	5
Indifferent	2	1	4	1	7	—	—	—	—
Not listed	5	2	7	—	—	1	9	2	9
Satisfactions in wage of selected workmen									
Total	75	27	100	15	100	11	100	22	100
A	23	2	7	8	53	1	9	12	55
B	24	19	73	1	7	2	18	2	9
C	18	4	13	5	33	7	64	2	9
Indifferent	—	—	—	—	—	—	—	—	—
Not listed	10	2	7	1	7	1	9	6	27
Satisfactions in conditions of work for selected workmen									
Total	75	27	100	15	100	11	100	22	100
A	26	—	—	12	80	9	82	5	23
B	23	13	48	3	20	1	9	6	27
C	14	9	34	—	—	—	—	5	23
Indifferent	2	2	7	—	—	—	—	—	—
Not listed	10	3	11	—	—	1	9	6	27

* Grade of satisfaction is based on numbers of sources of satisfaction.

TABLE XIII

Therblig skill averages of selected workmen on machines operated

MACHINES OPERATED	ALL THERBLIG SKILL AVERAGES	AVERAGE OF SPECIFIED SKILL UNITS PER THERBLIG											
										Sensitivities of			
		Machines	Material	Tools	Accuracy	Motion saving	Adaptation of energy to need	Self-confidence	Plan	Eye	Ear	Touch	Kinesthetic
Plant A													
Plant average	2.19	.42	.09	.06	.38	.04	—	.85	—	.22	—	.13	—
Grinder I.D.	2.32	.57	.08	.09	.55	.01	—	.74	—	.19	.01	.08	—
Grinder O.D.	1.81	.28	.13	.02	.27	—	—	.85	—	.15	—	.11	—
Grinder surface	1.07	.26	.10	.06	.13	.05	—	.35	—	.06	—	.06	—
Groover	2.80	.36	.11	.17	.52	.11	—	1.00	—	.37	—	.16	—
Lathe engine	2.33	.45	.15	.08	.40	.02	—	.91	—	.22	—	.10	—
Lathe turret	2.58	.53	.05	.04	.44	.02	—	1.00	—	.30	—	.20	—
Punch press	1.82	.21	—	—	.21	.07	—	1.00	—	.18	—	.15	—
Plant B													
Plant average*	3.27	.08	.21	.10	.81	.09	.76	.77	.26	.10	—	.04	.05
Assembly	4.07	—	.27	.03	1.00	.05	1.00	1.00	.53	.09	—	.01	.09
Drill Press	2.08	.06	.10	.08	.42	—	.68	.68	—	.02	—	.02	.02
Engraving	2.37	.16	.17	.12	.65	.24	.38	.38	—	.15	—	.12	—
Hand screw	3.95	.27	.25	.23	1.00	—	1.00	1.00	.05	.10	—	—	.05
Punch press	1.75	.25	.10	—	1.00	—	—	.40	—	—	—	—	—
Plant C													
Plant average	3.22	.50	.14	.41	.65	.21	.02	.81	.05	.18	.04	.09	.12
Drill press	2.23	.18	.11	.68	.28	.02	—	.33	—	.14	—	.35	.14
Lathe engine	3.09	.48	.24	.50	.41	.36	—	.52	.13	.23	.01	.06	.15
Lathe turret	3.61	.64	.11	.35	.83	.25	—	.98	.04	.19	.05	.05	.12
Milling machine	2.91	.33	.07	.30	.75	.02	.09	1.00	.01	.12	.05	.10	.07
Plant D													
Plant average	3.41	.49	.31	.49	.37	.08	.14	.95	.14	.25	.13	.06	—
Horizontal bore	3.94	.86	.70	.63	.72	—	—	.66	.07	.27	.02	.01	—
Drill press (1)	2.32	.50	.17	.40	.03	—	—	.99	.02	.09	.08	.04	—
Drill press (2)	3.69	.52	.36	.51	.11	.45	—	1.00	.10	.33	.15	.16	—
Grinder	2.72	.51	.24	.19	.24	.16	—	1.00	.09	.14	.08	.07	—
Lathe engine	3.54	.32	.28	.49	.62	.02	.46	.79	.06	.29	.12	.09	—
Lathe turret	4.76	.56	.44	.63	.72	.04	.58	.99	.08	.46	.19	.07	—
Milling machine	3.44	.52	.39	.61	.17	.09	—	.99	.04	.36	.26	.01	—
Planer	2.97	.35	.12	.36	.53	—	—	1.00	.55	.05	—	.03	—

* The average S/T without assembly is 2.50 for Plant B.

TABLE XIV

Marital status and size of family. Selected workmen, Plants A, B, C and D

	TOTAL	PLANTS			
		A	B	C	D
Marital status of workmen					
Total	75	27	15	11	22
Single	18	3	8	2	5
Married	53	23	6	8	16
Widowed	1	—	—	—	1
Not given	3	1	1	1	—
The size of family of married workmen					
Total with families	53	23	6	8	16
No children	18	10	2	2	4
One child	8	3	—	2	3
Two children	13	6	1	1	5
Three children	7	1	2	2	2
Four or more children	7	3	1	1	2

TABLE XV

*Grade of home. Selected workmen, Plants A, C and D**

PER CENT GRADE OF HOME	TOTAL	PLANTS		
		A	C	D
Total	60	27	11	22
100	11	6	3	2
100–85	17	12	4	1
85–70	13	3	2	8
70–55	8	3	—	5
55 and below	2	—	—	2
Not listed	9	3	2	4

* Information was not obtained for Plant B.

TABLE XVI

Leisure-time activities of selected workmen

TYPE OF ACTIVITY	TOTAL	MEN ENGAGING IN GIVEN ACTIVITIES IN GIVEN PLANTS			
		A	B	C	D
Sports, outdoor	37	20	4	5	8
Sports, indoor	32	15	2	5	10
Amusements A*	37	21	2	8	6
Amusements B*	20	11	1	6	2
Home	54	24	3	10	17
Men reported		24	5	10	20

* Amusements A include moving pictures, musical shows, vaudeville, etc. Amusements B include opera, theatre, concerts, lectures, etc.

TABLE XVII

Trade experience of selected workmen. Plants A, B, C and D

YEARS IN EMPLOYMENT	TOTAL	PLANTS			
		A	B	C	D
Trade experience of workmen in present employment					
Present employment	75	27	15	11	22
Under 5 years	30	12	13	3	2
5 to 10 years	29	10	1	5	13
10 years and over	14	4	1	2	7
Not listed	2	1	—	1	—
Trade experience of workmen in previous employment					
Other machine shop	41	14	8	9	10
Under 5 years	*17*	*5*	*5*	*5*	*2*
5 years and over	*24*	*9*	*3*	*4*	*8*
Other trade	44	19	11	5	9
Not listed	2	1	—	1	—

TABLE XVIII

Comparison of S.I.$_1$ with production standing. Selected workmen, Plant A

S.I.$_1$	GRADE OF PRODUCTION STANDING			
	TOTAL	1	2	3
Total.....	21	—	8	13
50–75	3	—	2	1
75–100	6	—	1	5
100–125	10	—	4	6
125–150	1	—	1	—
150–175	1	—	—	1

TABLE XIX

Comparison of S.I.$_2$ with skill rating. Selected workmen, Plants A and D

S.I.$_2$	SKILL RATING				
	Total	1–25	25–50	50–75	75–100
Plant A					
Total.....	21	1	18	2	
1–25	1		1		
25–50	3		2	1	
50–75	9	1	8		
75–100	8		7	1	
100–125					
125–150					
150–175					
175–200					
Plant D					
Total.....	21			6	15
1–25					
25–50					
50–75	2			1	1
75–100	7			2	5
100–125	4			1	3
125–150	6			2	4
150–175	1				1
175–200	1				1

TABLE XX

Comparison of S.I.₂ with habits of work. Selected workmen, Plants A and D

S.I.₂	RATINGS ON HABITS OF WORK				
	Total	60–70	70–80	80–90	90–100
Plant A					
Total.....	21	1	3	5	12
25–50	1				1
50–75	3			1	2
75–100	4	1			3
100–125	10		1	4	5
125–150	3		2		1
150–175					
Plant D					
Total.....	21	1	4	5	11
25–50					
50–75	3				3
75–100	9		1	2	6
100–125	3		1	1	1
125–150	5	1	2	1	1
150–175	1			1	

TABLE XXI

Comparison of S.I.₂ with attitude toward work. Selected workmen, Plants A and D

S..I₂	RATINGS OF ATTITUDE TOWARD WORK			
	Total	25–50	50–75	75–100
Plant A				
Total.....	21	4	12	5
25–50	1		1	
50–75	3	1	2	
75–100	4	1	2	1
100–125	10	2	6	2
125–150	3		1	2
150–175				
Plant D				
Total.....	21	0	5	16
25–50				
50–75	3			3
75–100	9		3	6
100–125	3		1	2
125–150	5		1	4
150–175	1			1

TABLE XXII

Comparison of S.I.$_2$ with ratings on relation to management. Selected workmen, Plants A, B, C and D

S.I.$_2$	RATINGS ON RELATION TO MANAGEMENT			
	Total	25–50	50–75	75–100
Plant A				
Total	21	5	3	13
1–25				
25–50	1		1	
50–75	3	1	1	1
75–100	4			4
100–125	10	1	1	8
125–150	3	3		
150–175				
Plant B				
Total	15	1	6	8
1–25	1			1
25–50	3		2	1
50–75	1		1	
75–100	2			2
100–125	6	1	2	3
125–150	2		1	1
150–175				
Plant C				
Total	10	0	0	10
1–25				
25–50	1			1
50–75	4			4
75–100	—			—
100–125	3			3
125–150	2			2
150–175				
Plant D				
Total	21	0	8	13
1–25				
25–50				
50–75	3	—	—	3
75–100	9	—	4	5
100–125	3	—	—	3
125–150	5	—	4	1
150–175	1	—	—	1

TABLE XXIII

Comparison of S.I.₂ with grade of school attained. Selected workmen, Plants A, B, C and D

S.I.₂	TOTAL	GRADE OF SCHOOL ATTAINED			
		5–6	7–8	9–10	11–13
Plant A					
Total	21	5	13	2	1
25–50	—				
50–75	3		3		
75–100	5		3	1	1
100–125	10	4	5	1	
125–150	3	1	2		
150–175					
Plant B					
Total	8		3	3	2
25–50	3		1	1	1
50–75	—				
75–100	2		1	1	
100–125	3		1	1	1
125–150	—				
150–175					
Plant C					
Total	10		5	2	3
25–50	1			1	
50–75	4		1	1	2
75–100	—				
100–125	3		3		
125–150	2		1		1
150–175					
Plant D					
Total	13	—	7	6	—
25–50					
50–75	2		2		
75–100	7		4	3	
100–125	—				
125–150	3			3	
150–175	1		1		

TABLE XXIV

Comparison of S.I.$_2$ with trade training. Selected workmen, Plants A, B, C and D

S.I.$_2$	TOTAL	GRADE OF TRADE TRAINING				
		1	2	3	4	5
Plant A						
Total.....	23	10	8	1	1	3
1–25						
25–50	1	1				
50–75	3		2			1
75–100	6	4	2			
100–125	10	4	3	1		2
125–150	3	1	1		1	
150–175						
Plant B						
Total.....	15	11	1		3	—
1–25	1				1	
25–50	3	2	1			
50–75	1	1				
75–100	2	2				
100–125	6	4			2	
125–150	2	2				
150–175						
Plant C						
Total.....	10	3	—		1	6
1–25						
25–50	1	1				
50–75	4	1				3
75–100	—					
100–125	3	1				2
125–150	2				1	1
150–175						
Plant D						
Total.....	18	6	1		5	6
1–25						
25–50						
50–75	3	2			1	
75–100	7	2			2	3
100–125	2				1	1
125–150	5	2			1	2
150–175	1		1			

TABLE XXV

Comparison of S.I.$_2$ with wage. Selected workmen, Plant A

S.I.$_2$	WAGE PER WEEK		
	Total	25–35	35–45
Total.....	23	6	17
25–50	1	1	
50–75	3		3
75–100	6	2	4
100–125	10	3	7
125–150	3		3

Manuscript received October 7, 1929

The Outlook in the Measurement of Interests

By the Research Committee upon the Measurement of Interests[1]

What IS *an interest? Precisely what is meant by an occupational preference, a liking, an antipathy? How can the fact of its presence in a person's make-up be certainly ascertained, its strength measured and its persistence determined? Such questions come to the fore in the following array of live research problems which challenge the contemporary investigator of interests.*

The editor would like to see this whole array of problems attacked more directly than has heretofore been usual. Why not study the nature, direction and power of a boy's interests, not by ASKING *him whether he likes or dislikes aviation, piano practice, robbing birds' nests, and solving originals in geometry, but by determining his actual behavior when face to face with authentic alternative opportunities, under controlled conditions? Such an approach brings the investigator at least one step closer to the living phenomenon of interest. An intelligence test measures intelligence in action. It requires that intelligence be exercised. An interest test should likewise demand, not a verbal statement about an interest, but its actual functioning.*

INTERESTS are coming to be regarded as an important psychological factor to be considered in the personnel examination, both in industry and in education. Yet the measurement of interests has but ten years of research behind it, although over fifty individuals have been engaged in research in the field of interests during this period. While much has been accomplished in establishing measuring devices of interests, the practical application of inventories and tests has gone far beyond our knowledge of their value. Everything points to a wide usefulness of interest measures, possibly a usefulness equal to intelligence measures. But before these measures are given authority in guidance and selection more should be known of their validity, reliability, and standards.

This major problem invites careful

[1] Committee appointed at the Atlantic City meetings of the National Vocational Guidance Association, to encourage practical research projects in the measurement of interests. The committee is composed of the following members: Karl M. Cowdery (Stanford), Douglas Fryer (New York), Harry D. Kitson (Columbia), Donald G. Paterson (Minnesota), E. K. Strong (Stanford), R. S. Uhrbrock (Cornell).

research. A research committee, to consider the problems of interest research, developed out of the round-table upon "The Measurement of Interests in Guidance," which was a part of the program of the Atlantic City meetings of the National Vocational Guidance Association. This committee was unanimous in the feeling that careful research should be stimulated to evaluate the present interest measures and interest concepts in psychology. As a step in this direction the committee planned a survey of existing problems, which were contemplated pieces of research, or thought to be important problems by prominent research workers in the field of interest measurement. The results of this survey are published below, and the names of the contributors of the various topics are included to enable the person who may plan research upon a problem that is suggested to gain any further suggestions that the contributor may care to give.

This list of research topics is classified into various fields of interest research. Over fifty topics are included. While others might be added, the list indicates very well the present outlook in the measurement of interests.

THE REPORT OF INTEREST RESEARCH

A. THE DEVELOPMENT OF INTERESTS AND THEIR FOUNDATION IN TRAINING AND INHERITANCE

1. *The Crystalization of Interest Attitudes and their Future Constancy.* Using any interest inventory and the inventory scoring technique, research should attempt to discover at what age various "type" interests or general interest attitudes crystallize. By "type" interests are meant groups of attitudes found to be typical of lawyers, ministers, doctors or other professions. Upon discovery of the age that "type" interests crystallize a second problem would be to trace their development in the same individual over a period of years.—*Karl M. Cowdery, Stanford University.*
2. *Susceptibility of Interests to Training.* Are interests due to environmental conditions or to innate capacities? The investigation of such questions as the following should throw light on the problems: Do individuals who score low in medical interests develop interests in the field of medicine through training, and later rate higher in this professional interest? Do individuals who score low in a professional interest tend to drop out of professional training more rapidly than those who score higher?—*E. K. Strong, Jr., Stanford University.*
3. *Range of Vocational Interests for Ages and Grades.* Many investigations have shown that school children tend to choose from a narrow range of occupations (chiefly the white collar jobs). Does this range increase or decrease with age (ages 6 to 22) and schooling (grades 1 to 16)?—*H. D. Kitson, Columbia University.*
4. *Discover the Main Types of Conflicting Interests to be met in High School and College.* What are the sort of common decisions which have to be faced? Are they between teaching and law, selling and nursing, etc., or between staying at home and going to college, getting engaged and earning a living, etc.?—*J. B. Miner, University of Kentucky.*
5. *The Stability of Interest Patterns.* The stability of interest patterns can best be determined by follow-up studies on young children into adolescence and maturity. The same inventory should be used at each level of investigation and various occupational scor-

ing keys should be applied at each level to determine the fluctuation.—*H. H. Remmers, Purdue University.*

6. *Age of Vocational Choice by Occupation.* At what age do people in various occupations define their occupational interest?—*H. D. Kitson, Columbia University.*
7. *Effect Upon Interest Scores of Incidental Experiences.* In this study a group would be subjected to some pleasant or unpleasant experience corresponding to certain items in the interest inventory. For example, very hard problems might be assigned in mathematics accompanied each day by a general scolding for knowing so little about the work. Test before and immediately after the experience. Then test a month later to see if the effect was temporary.—*P. P. Brainard, University of Michigan.*
8. *The Genesis and Rate of Change in Interest Patterns.* This problem can be experimentally attacked by determining the interests of children of a given age, social level, sex, etc., and then subjecting them to systematic instruction (e.g., "a course in vocations"). Differential results could then be studied in terms of scores on interest blanks which are made by an experimental instructed group compared with a control group not so instructed.—*H. H. Remmers, Purdue University.*

B. INTERESTS AND ACHIEVEMENT

9. *The Development of Interests Based Upon Special Abilities.* Investigation might be made of the crystallization of interests around special group of abilities. Subjects might be selected at an early age by a standard special abilities test. Then interest inventories could be scored for this special group of abilities or for occupations requiring this group of special abilities. A comparative follow-up over a period of years by means of these measures would indicate the development of interests upon special abilities.—*E. K. Strong, Jr., Stanford University.*
10. *Predicting Vocational Choice and Vocational Success from Interests.* Strong's Vocational Interest Blank might be given to a large number of college seniors, and scored for various professional interests. These individuals would be followed-up, upon securing a position, for choice, and five years later, for success. Probability tables could be made out from this data predicting vocational choice and vocational success from the interest inventory.—*Frank K. Shuttleworth, Yale University.*
11. *Relation Between Levels of Professional Interests and Professional Aptitudes.* Determinations might be made of coincidence between levels of professional interests as determined by scoring keys applied to the interest inventory and levels of professional aptitude as measured by professional aptitude tests.—*Karl M. Cowdery, Stanford University.*
12. *The Relation of Interests and "Aptitude".* The rôle of interests in determining "Aptitude" might be studied by the comparison of scores in the Stanford Scientific Aptitude Test, or Chemistry Test, or Mathematics Test, or any Mechanical Aptitude Tests, with scores in an interest inventory (which is scored for interests in a similar field). Strong's, or any other inventory, might be used for this purpose, and scoring keys could be devised upon contrasting groups with highest and lowest interests in the field under investigation.—*T. A. Langlie, Wesleyan University.*
13. *Permanence of Interests and Relation to Achievement.* This research would compare the degrees of permanence of interests estimated at intervals of six months over a period of at least two years and measures of achievement in school subjects.—*J. S. Orleans, World Book Co.*

C. IMPROVING THE INTEREST INVENTORY AND ITS SCORING

14. *Common Interests of Occupational Groups.* The investigation of common or like interests among individuals in various occupational groups, and other social groups, is needed to establish discriminating interests which might be included in the interest inventory. This might be done by developing interest inventories for the various occupational groups, and by trial upon samples of these occupational groups, eliminate those interests which are not common to that occupational group. This evidence would not only indicate interests characteristic of particular occupational groups, but interests common to larger vocational groupings.—*Douglas Fryer, New York University.*

15. *The Interests of Tradesmen.* The development of scoring keys to score the interest inventory for trades such as carpenter, machinist, etc.—*E. K. Strong, Jr., Stanford University.*

16. *The Reliability of Single Items of the Interest Inventory.* An inventory, such as Strong's Vocational Interest Blank, might be repeated several weeks apart and the correspondence between first and second reactions determined for each item. If certain items yield more consistent responses, such information should be of considerable help in revising the inventory or in constructing duplicate forms.—*Frank K. Shuttleworth, Yale University.*

17. *The Correlation of Personal History Items with Separate Items of the Interest Inventory.* At the present stage of development of interest measurement it is more important that we know the nature of the human activities represented by the items of the interest inventory, than that we attempt the classification of people as "introvert," etc. Strong's or any list of interests, might be used as the basis for comparison with personal history items.—*W. H. Brentlinger, Oberlin College.*

18. *Development of Equivalent Forms of Interest Inventory.* The same interest inventory might be presented several times with variations in the wording of items each time it is presented. The constancy of reaction to certain wordings rather than others would be indicated. Where the same reaction is general to two forms of wording, two forms of the inventory may be constructed.—*P. P. Brainard, University of Michigan.*

19. *Refinement of the Method of Recording Interests.* Comparison of the method indicating likes and dislikes on a list of occupations, magazines, activities, etc., with the method of checking the direction of interest between contrasting working conditions such as indoor-outdoor, working alone—working with others, etc.—*J. B. Miner, University of Kentucky.*

20. *Determination of the Characteristic Reactions of "Special Interest Groups" to the Interest Inventory.* Such organizations as the D. A. R., the Ohio State University "Holiness Society" (recently announced), the Volunteer Bands of denominational colleges, etc., represent material for this type of study. It is possible that the selection of distinguishing items forming an inventory for this purpose might be desirable, but the results from any interest inventory would be valuable. —*W. H. Brentlinger, Oberlin College.*

21. *A Search for Universal Interests.* A survey of the literature upon interests might be made, particularly the older literature before measures of interests were developed, for suggestions of universal interests. Certain universal interests may be characteristic of various ages, races, nations and sex. Such a list of universal interests would indicate items to include in universal interest inventories and items not to include in interest inventories prepared to distinguish between social and occupational groups.—*Douglas Fryer, New York University.*

22. *Universality of Interests as a Success Factor, in Sales and Executive* Occu-

pations. A Universal Interest Inventory like that used by Marrow would indicate the comparative universality of the interests in these occupations. The Strong Vocational Interest Blank, scored for various occupations, would indicate the extent to which these occupational workers have the interests of more specialized occupations.—*L. R. Frazier, Dennison Mfg. Co.*

23. *Scoring Keys for Salesmen.* The attempt might be made to develop scoring keys for the interest inventory upon the distinguishing interests (if such exist) of various groups of salesmen, such as salesmen who sell intangibles and salesmen who sell commodities.—*H. G. Kenagy, Life Insurance Sales Research Bureau.*

24. *The Determination of Aversions for the Interest Inventory.* The search for interest items characteristic of any clearly defined occupational group might be supplemented by a study of distinguishing aversions of that group. A man may be in a particular line of work because this vocation offers an escape, a retreat, from annoying situations that exist in other occupations.—*Richard S. Uhrbrock, Cornell University.*

25. *The Determination of Constellations of Interests Characteristic of Outstanding Students in the Arts and Sciences.* For the purposes of this research, it is suggested that Strong's Vocational Interest Blank should be filled out by 250 Phi Beta Kappa and 250 Sigma Xi men whose ages range from eighteen to twenty-three years. Results should be scored by the inventory scoring technique to reveal similarities and differences in interests.—*Richard S. Uhrbrock, Cornell University.*

26. *The Similarity of Interests at Different Levels of Ability.* This investigation would attempt to determine what occupations at different levels of ability have similar interests. Individuals of widely different abilities show similar interests. What occupations satisfying similar interests are there to be recommended to individuals with similar interests but different abilities? Another approach would be to determine if the interests of occupations at the same level of ability show any similarity in interests.—*B. V. Moore, Pennsylvania State College.*

27. *A Comparison of the Objectivity of Interests as Determined by a Paired Comparison Machine and as Determined by Any One of the Uusual Methods.* The paired comparison machine will present pictures, names of activities, etc., in pairs, to which the relative order of liking for alternatives can be estimated. The order determined by this method can be compared with the order secured by ranking cards, by placing ordinal numerals in front of the items of a list, and by any other method. This comparison will show if the ordering of interests is an objective procedure. The method showing the highest correlation with itself on a subsequent event is, presumably, the most objective.—*Herbert A. Toops, Ohio State University.*

28. *A determination of the control conditions, as to verbal or printed directions, etc., which best reveal interests.* Conceivably, one will arrive at somewhat different interests if one picks the item of a pair which he likes best or the item of a pair which he likes least; or the item of three which is "least innocuous"; and still a somewhat different result if he picks the item from among some five or half dozen alternative choices. Various other *forms* of testing device should be tried out under carefully controlled conditions. The tests used should have a reliability of fully 0.90.—*Herbert A. Toops, Ohio State University.*

D. DEVELOPING NORMS FOR THE INTEREST INVENTORY

29. *The Absence of Occupational Interests Among College Students.* Why do some college students not rate high

on any of the present occupational scales? This may be due to the fact that their interests are in some other line than occupations for which they can be scored. It may be due to the fact that there are some men who do not have the interests of any occupation or profession.—*E. K. Strong, Jr., Stanford University.*

30. *Occupational Shifts and Interests.* A long time study might be made of individuals to whom have been given the Strong Inventory and scored for various occupational interests (at college graduation). This study might develop predictive norms of possible shifts into the occupations for which highest interest scores were received.—*A. T. Poffenberger, Columbia University.*

31. *The Development of Age Norms for the Interest Inventory.* This is a study of both theoretical and practical application. Terman, Lehman and Witty, have developed age norms for play interests. Other studies might deal with interests over a wide range of social activities, indicating norms for interests in social activity.—*W. H. Brentlinger, Oberlin College.*

32. *The Differential Prediction of the Interest inventory within an Occupation.* Comparisons of degrees of occupational interests on Strong's scales might be made with degrees of achievement (either rated or measured by aptitude tests) in the various occupations for which such comparative measures have been developed.—*A. T. Poffenberger, Columbia University.*

E. OBJECTIVE METHODS OF MEASUREMENT

33. *Involuntary Movement as Diagnostic of Interests.* A study might be made of involuntary movement measured by an automatograph or planchette, while the subject is presented with descriptions or pictures, or even moving pictures of situations, or objects differing very widely in their presumed interest appeal. It is conceivable that involuntary movement might serve somewhat to differentiate the subject's reactions to these different stimuli. It could be given to groups of individuals known to differ in some fundamental interest and movements analyzed to determine diagnostic value or differential scores. —*H. E. Burtt, Ohio State University.*

34. *Measurement of Interests with Nonsense Materials by the Use of the Free Associations Method.* Ink blots, nonsense syllables, and nonsense figures might be used to stimulate free associations. The procedure in the trial of this measure would be similar to that followed by Jennie B. Wyman. (See Chapter XVI, "Tests of Intellectual, Social and Activity Interests", by Jennie B. Wyman in *Genetic Studies of Genius*, Vol. 1, Stanford University Press.)—*Douglas Fryer, New York University.*

35. *Knowledge of Vocations as an Index of Interests.* An information test, measuring knowledge of six to ten major occupations, and scored to provide a profile of the subject's knowledge of these vocations might be helpful in indicating vocational interests for guidance purposes.—*Frank K. Shuttleworth, Yale University.*

36. *An Objective Measurement of Interests.* A test in which irrelevant words are to be crossed out of the text in which they occur, varies widely in its appeal. There might, for example, be some texts dealing with some social situations, with sports and amusements, With business and the like, and differential scores between different types of material worked out and correlated with known difference in interests, such as might be obtained by giving such tests to men versus women, business men versus professional men, engineers versus salesmen, etc.—*H. E. Burtt, Ohio State University.*

37. *The Physiological Processes Involved in Being Interested.* An objective approach to this problem has been found through investigation of changes in secretions of the salivary glands. The

normal secretions of a subject when interested may be compared with secretions when engaged in activities in which he is not interested. Preliminary studies have shown that these secretions are totally or partially inhibited when the subject is actively at work on puzzles or tracing stars reflected in a mirror. With this method such factors as duration of interests, effect of rest pauses and the influence of fatigue upon interests may be objectively determined.—*A. L. Winsor, Cornell University.*

38. *A Comparison of Objective and Subjective Measures.* An information test of true-false, multiple choice or completion variety might be based upon the items of the interest inventory. Success and failure in the information test could be compared with like, indifference and dislike for the items of the inventory. A correspondence would indicate that the subjective measure and the objective measure of interests are related.—*Douglas Fryer, New York University.*

F. THE RATING SCALE

39. *The Degree of Interest in One's Occupation.* Measurement of degree of interest in one's occupation can be secured by means of a scale devised for this purpose on which the individual rates his interest in his occupation. With this technique, the average degree of interest which workers in one occupation have, could be compared with the average possessed by workers in any other occupation.—*H. D. Kitson, Columbia University.*

G. INTERESTS OF ABNORMALS

40. *The Relationship of Emotional Adjustments to Interest Patterns.* Abnormal Psychology and Psychiatry stress the doctrine that emotional adjustment (e.g., introversion *vs.* extroversion) leads to radically different interest patterns. This doctrine needs to be evaluated in terms of interest measurement. Instruments for measurement of emotional adjustment are such inventories as Thurstone's Personality Schedule, the Woodworth Psychoneurotic inventory, or various adaptations of this latter that have been made. Interest patterns of various adjustment groups can then be determined by the interest inventory with its scoring technique.—*H. H. Remmers, Purdue University.*

41. *Comparison of the Interests of Normals and Abnormals.* The interests of various abnormal groups, such as depressed patients and dementia praecox (simple phase in particular) patients might be compared with the interests of normal groups to see if abnormal mentality is distinctively a difference in interests.—*Douglas Fryer, New York University.*

H. SOCIAL RACIAL, AND GEOGRAPHIC DIFFERENCES IN INTERESTS

42. *The Distinguishing of Racial Groups by Their Interests.* This piece of research would involve the development of scoring keys for the interest inventory which would be based upon any distinguishing interests of racial groups that might be found, such as Jewish and Gentile differences. The inventory and its scoring technique would be applicable to this problem.—*Lorine Pruette, New York City.*

43. *The Isolation of Geographical Differences in Interests.* It is quite possible and even likely that inland children, for example, will have interest patterns which differ significantly from those of children living near rivers or sea coasts. Other geographical differentia such as rural vs. urban, North vs. South, East vs. West, etc., would come under this general problem. Strong's occupational scoring procedure (possibly improved through the use of sorting and tabulating machinery) would probably be applicable to the study of this problem.—*H. H. Remmers, Purdue University.*

44. *The Interest Patterns of Social-Economic Levels.* The interest patterns of social-economic levels might be studied by means of the interest inventory

and its scoring technique. The division of the primary group upon which to develop the scoring key could be made by means of several scales of social-economic levels (e.g., the Minnesota scale, the Chapman-Sims scale, and the Chapman-Sims scale as revised by Heilman).—*H. H. Remmers, Purdue University.*

45. *The Measurement of the Interests of Negro Children.* The distinctive interests of negro children might be compared for various ability groupings, and social groupings, and they might be compared with white children of the same age and sex.—*Dagny Sunne, Tulane University.*

46. *Familial Similarities in Interests.* This research would involve the administration of an interest inventory to an adequate samplying of male siblings within definite age limits and the determination of degrees of like response for the various items of the inventory.—*L. Dewey Anderson, Western Reserve University.*

47. *Racial Differences in Interests.* Using "race" in the strict anthropological sense racial groups might be segregated by various anthropometric criteria, such as head shape, and compared for interest differences by means of the interest inventory and its scoring technique.—*G. H. Estabrooks, Colgate University.*

I. SPECIAL GUIDANCE PROBLEMS

48. *The investigation of Avocations for Special Types of Workers (Department store executives and salespeople, for example) by means of Interest Measurements.* Various types of interest questionnaires might be presented to different groups of workers with the direction to check the activities that might interest them on the side, or as substitute activities on retirement. A compilation of present activities would serve to supplement this study. Such information could then be made the basis for guidance regarding profitable use of leisure time, and among those anticipating retirement. —*Natalie Kneeland, University of Pittsburgh.*

49. *Evaluation of Occupational Information Courses by Changes in Interest Scores.* Groups entering upon a course of study in occupations might be given an interest inventory, which would be scored for various occupations, before beginning the course and after completing it. Group scores and individual scores on each item might be compared.—*Paul P. Brainard, University of Michigan.*

50. *Evaluation of Occupational Experiences by Changes in Interest Scores.* Compare interest scores of a group before and after engaging in certain try-out courses.—*P. P. Brainard University of Michigan.*

51. *Determining Distinctive Interests in College Work.* This Research would attempt to determine the distinguishing interests of women college groups who select certain fields of educational training, such as the study of child development. Choices of subjects for college reports might be studied in the same manner.—*L. C. Wagoner, Vassar College.*

Manuscript received May 10, 1930

News Notes

PERSONNEL RESEARCH FEDERATION

In an effort to increase the service to its members, the Federation staff has made several changes in the Service Bulletin. The format has been improved and enlarged. The title is now Personnel Service Bulletin. Each issue contains a short article by an authority in the personnel field, as well as briefer notes aimed to help members to keep informed.

EMPLOYEE SUPERANNUATION

A research report, "Meeting the Cost of Employee Superannuation," prepared by the Committee on Industrial Relations of the National Metal Trades Association draws the following conclusions:

1. Provision for the care of superannuated employees, either through continued employment at minor tasks or through the operation of an actuarily sound and adequately financed pension system, is in complete harmony with the ideals of the National Metal Trades Association.

2. The operation of a sound industrial pension system is justified on an economic as well as a humane basis. Exerience in other countries indicates that measures intended to relieve public old age dependency do not reduce the desirability of industrial pension plans.

3. No pension plan should be entered into recklessly and without careful study, nor without providing for competent actuarial supervision and sound accounting methods. Means of administration should be independent of the employing company.

4. No pension promise should be made which is based upon Management's hope of permanence and continuing prosperity. Instead, pension promises should be based solely upon the amount of money actually available for pension purposes.

5. Constant actuarial supervision is essential to the success of a privately operated pension plan. However, since mortality and disability figures are based upon mass experience and future salaries and labor turnover rates are subject to so many varying influences, it seems inadvisable for any except the very largest employers to attempt to operate their own pension plans. Even then, there is the risk that the number of pensioners will be so small as to render improbable experience conforming to life tables. In small and medium sized plants, especially, employers would probably be well advised to delegate the operation of a pension plan to one of the various insurance companies that already have the organization, experience, and established accounting methods which are necessary for the operation of a sound plan.

REGULARIZING EMPLOYMENT

"Regularizing Employment," a report prepared for the Committee on the permanent Aspects of Unemployment of the A. I. C. P., outlines what is being done at the present time on this problem. Stating that efforts to stabilize employment emanate from four sources: 1. Business, 2. Community groups, including local and county officials, 3. The state and federal government, and 4. Private agencies and individuals, the report goes on to describe the steps being taken by these four agencies.

GIRL SCOUTS RATE CAMPS AND CAMP DIRECTORS

The Girl Scouts, Inc., is experimenting with scales for rating its camp directors and camps. A comprehensive rating scale prepared by the staff of the Personnel Research Federation is being tried out this summer in a mid-western region where the camping program is especially well developed. Evaluation in the fall will deter-

mine further steps and extension of this work, upon which it is hoped to base licensing and training programs. Agnes B. Leahy, Executive Secretary of the Personnel Division of the national Girl Scouts organization, is in charge of this development.

BOY SCOUTS PERSONNEL DEPARTMENT

Establishd June 1, 1927, the Personnel Department of the Boy Scouts of America has already made long strides forward under the directorship of Ernest A. Stowell.

The work of the personnel department consists of the recruiting of men for attendance at the national training school, the placement of these men after the completion of their course, the transfer and promotion of men of demonstrated ability and the elimination from the service of those whose records do not justify continuing their employment.

In the discharge of these duties for the year ending December 31, 1929, the personnel department recruited 157 men for attendance at the national training school, placed 126 of them in the service of scouting, advanced 149 men already employed in line of promotion, approved the employment and deferred the training of 31 other men under the 60-day provisional appointment plan, and filled 311 vacancies in the professional service throughout the country. The year ended with 45 positions still open.

During the year 162 men were introduced into the service in positions made possible by the normal growth of existing councils, the development of extension projects in 53 other councils, and the creation of 12 new councils. There were approximately 1,032 full-time employees in the professional service as of December 31, 1929.

Of 356 vacancies existing throughout the country during the year, 166 were caused by withdrawals from the service which involved the discharge of 97 men for incompetency.

BELOIT COLLEGE

Beloit College has established a personnel office in charge of an alumnus, the Rev. Edward W. Hale, formerly of New York City. Mr. Hale's duties include contacts with the secondary schools and advice to prospective students; development of educational and vocational guidance services to students while in college; and oversight of senior and alumni placement and follow-up. He will act as staff officer and consultant with reference to all the activities of the college which are specifically directed toward educational and vocational adjustment throughout the entire period of the students' contacts with the institution.

SUGGESTED RESEARCH TOPICS IN COLLEGE PERSONNEL

"Two Hundred Research Problems for a Five Year Research Program into the College Entrance Problem" is the title of Ohio College Association Bulletin No. 61. In addition to the valuable mapping-out of the field of necessary research, which is extremely suggestive and stimulating, helpful hints are given for attack on problems and preparation of findings.

Anyone planning to write a dissertation in the college personnel field or to carry on such research for other purposes will do well to get a copy of this Bulletin.

NATION-WIDE STUDY OF ENGLISH USAGE

The Psychological Corporation is sponsoring a Nation-Wide Experimental Study of English Usage which is of interest from the viewpoint of testing technique as well as teaching methods.

It has been stated by authorities who have done research in this field that forty per cent of the rules which pupils now study are obsolete or non-essential, and are the cause of much confusion and failure to master English usage. These rules are largely ignored by the best writers. The elimination of non-essentials here does not involve any loss from the point of view of unity of expression or good usage, but promises better mastery of usage at the expense of less time and effort.

Special diagnostic tests are being prepared for the study covering one hundred phases of usage which have been found to present major difficulties. The tests are suitable for administration at any level above the Fifth Grade and to adults. The study aims to determine a more objective

and practical allotment of phases of usage for instruction in each grade and to improve understanding of instructional methods necessary for mastery of different phases of usage. The special diagnositc tests will be available for use next October. Schools throughout the country are being invited to participate in the study.

Inasmuch as the tests and the materials provide a prompt means for discovering errors in usage and suggest the most effective methods for correction and mastery, it is likely that they will be of interest to department stores and other business firms desiring to better the usage of English by their employees.

PERSONNEL CALENDAR

SEPTEMBER 9–12. *International Association of Public Employment Services.* Toronto, Canada.

SEPTEMBER 22–26. *International Association of Industrial Accident Boards and Commissions.* Wilmington, Delaware.

SEPTEMBER 29—OCTOBER 4. *Nineteenth Annual Safety Congress. National Safety Council.* Pittsburgh, Pennsylvania.

AUGUST 26—SEPTEMBER 6. *Hanover Conference. Social Science Research Council.* Hanover, New Hampshire.

AUGUST 27–31. *Silver Bay Conference on Industrial Relations.* Auspices National Council, Y. M. C. A. Silver Bay, New York.

OCTOBER 11. *Annual Business Meeting, Corporate Members.* PERSONNEL RESEARCH FEDERATION. New York City.

NOVEMBER 14–15. *Annual Fall Conference.* PERSONNEL RESEARCH FEDERATION. New York City.

PERSONAL ITEMS

DR. J. MCKEEN CATTELL, distinguished psychologist, was recently presented with a gold medal by the Society of Arts and Sciences. Two medals are awarded annually for outstanding accomplishment in science.

GRACE E. MANSON has joined the faculty of Northwestern University as Associate Professor of Psychology and Assistant Director of the Personnel Bureau. Dr. Manson will divide her time between teaching courses in Mental Measurements and Social Psychology, and coöperating in the activities of the Personnel Bureau.

EDWARD J. SPARLING has accepted a position as vocational counselor and Assistant Professor of Vocational Guidance at Long Island University, Brooklyn, N. Y. This institute, which has been organized only three years, has already developed a thriving Department of Personnel which serves its 1400 students. The Bureau is under the direction of Dr. Robert C. Whitford.

Personnel Books

EDITED BY DOUGLAS FRYER

This issue of Personnel Books emphasizes the application of the scientific method to industry's personnel problems. In the October issue the aim will be again to represent the breadth and variety of personnel activities through reviews of published books. Plans are to emphasize in the December issue the application of the scientific method to the problems of vocational guidance, as there are many excellent books appearing this year which discuss these activities. The leading review of this issue deals with wage incentives, which is becoming more and more a problem for scientific analysis. All the studies of motivation in psychology, some of which are reviewed from time to time in these columns, have a practical bearing upon this problem. According to Edward S. Cowdrick, the present-day philosophy of the Taylor Society upon industrial relations is reflected in the book by that organization which is reviewed here. Monard V. Hayes shows us the up-to-date point of view in the use of accountancy, according to LeRoy E. Kimball, and Meyer Bloomfield emphasizes the importance of the system of tribunals known as the Impartial Chairman. In "Briefer Mention" there are a number of the leading recent books in the field of economics, which are reviewed for these columns by Margaret Myers. This issue includes "New Books" published during April and May.

WAGES AND WORK

WAGE INCENTIVE METHODS, THEIR SELECTION, INSTALLATION AND OPERATION. By Charles Walter Lytle. New York: Ronald, 1929, v + 457 pp., $7.50

Reviewed by HAROLD E. BURTT, *Ohio State University*

The book is a thorough-going critical review of the whole matter of wage incentive in industry. The introductory chapter sketches the general advantages of incentives and cites frequent and marked increases in production. It presents results of various surveys and questionnaires, bringing out the fact that almost half the industries investigated were using some type of incentive plan, and those which had adopted one kept on using it.

The second chapter on "Classification of Incentives Plans" gives a birdseye view of the whole problem. The author suggests a general classification on the basis of (1) immediate stimulation of effort, (2) long time stimulation for team work. Getting down to financial incentives, he classifies

them according to whether (1) the employer takes all the gain or loss, (2) the employee takes all the gain or loss, (3) the gain is shared, (4) empirical location is made of points between the two variables. He gives diagrams showing how most financial incentives involve the same two variables—time wages and wages saved, but with different weighting.

When it comes to selection of the plan (Chapter III) we must consider quality, quantity, and economy of materials, and their relative importance in the particular job in question. The author feels that incentive is not a cure-all, and that good management is necessary. Numerous charts and tables show the total cost of various incentive plans. The aim is to hold the maximum number of employees near their maximum production. There is an analysis of various justifiable plans with information as to why and how. In this manner the author selects ten fundamental plans, such as day rate, multiple time, high piece rate, etc., and claims that these provide us with every kind of incentive which we need.

The following chapters go into a more detailed consideration of these various plans. Among the problems discussed are group incentive plans, setting base rates, studying individual job rates, making a premium for versatility, that is, a bonus, if the worker acquires proficiency in any other class of work than that in which he is engaged. The point is also very wisely stressed that definite policies of this sort should be announced and posted so that everyone knows exactly what is happening. Then follow discussions of the installation of incentive plans, time rate plans, single rate plans, combined time bonus and piece rate plans, and profit sharing plans with their distinctive advantage in the psychological effect of feelings of partnership.

Then we have a consideration of other incentive plans supplementary to production. If a beginner, for example, goes on a piece rate he is apt to be discouraged. We need flexibility because of these individual differences, particularly in the early stages of training. Specific promotion scales for apprentices are desirable. Then we may reward the individuals for quality, although this is not so general a factor now that the work is so well standardized. Reducing waste is sometimes rewarded and we likewise have prizes for suggestions, for waste elimination, and sometimes for attendance. The incentive plans may even be extended to indirect work and supervision, for example, the amount loaded, or, the number of packages handled, or, gas saved per mile. Even with inspection work we may get incentive by the use of super-inspectors.

Finally, even for supervisors, office employees and executives, incentives are possible. For the former the bonus is usually in terms of what his group does. In office work we may score employees on errors in work or on number of typewriter keys struck. Profit sharing is one of the best types of incentive for executives. The appendix gives methods for studying incentive plans in detail.

The book on the whole is an erudite piece of work. It goes into a great many of the incentive plans that have been tried, analyzes them in considerable detail, and shows their possibilities and short-comings. The book naturally deals more with the statistics of the plans rather than with any psychological analysis of the incentive. For instance, we read about the need of leadership for the group incentive plan, but have little suggestion as to how to get the leader or what constitutes leadership. The treatment is replete with quotations from various men in industry. It requires rather careful reading, for there are no chapter summaries and there is a wealth of tabular and statistical detail. On the whole, while it contains little of interest to a psychologist, from a purely theoretical standpoint, it is replete with facts which should be of considerable value to the business man. One who is in the front line certainly will find it worthy of study.

AFTER TAYLOR

SCIENTIFIC MANAGEMENT IN AMERICAN INDUSTRY. By The Taylor Society. New York: Harper, 1929, xix + 479 pp., $6.00

Reviewed by EDWARD S. COWDRICK, *New York City*

In 1928 the Taylor Society undertook the preparation of "a comprehensive treatise on scientific management." The project was mapped out by the national organization and the different topics were assigned to more than twenty authors, each considered an authority in the particular field in which he was to work. Naturally, in covering so broad a subject within the limits of a single volume, the authors have in most cases confined themselves to brief and somewhat abstract discussion. A few sections, however, have been expanded to include a degree of detail comparable to that usually found in works of the "handbook" type. This detailed treatment is found, for example, in the chapters on "Classification and Symbolization" by Morris Llewellyn Cooke; on "General Administrative Standards" by Howard Coonley and Joseph H. Barber; on "Merchandising Standards" by John S. Keir and Henry S. Dennison, and on "Factory Operation Standards" by Leslie E. Bryant and G. E. Schulz.

As was to be expected in a book prepared under the direction of the Taylor Society, the subject of research is treated adequately and authoritatively. "If management is to be in any sense scientific, it is essential that administrative decisions be based on investigation and analysis of facts rather than on the arbitrary and hasty edicts of officials," says Robert W. Burgess in the opening paragraph of his chapter on "Research for General Administration." This ideal of management based upon accurate knowledge and investigation is carried out in later chapters in which the authors discuss research as applied to production, merchandising and selling, clerical operations and personnel.

On the subject of personnel, the book may fairly be looked upon as reflecting the present philosophy of the Taylor Society as to the relationship between employees and management. In the very last chapter Robert Bruere attempts to trace the development of this philosophy. In the earlier activities of Frederick W. Taylor he finds little indication of regard for conditions surrounding the workingman. "As to shop conditions, for example, there is no word in Taylor's writings about the need for making the workshop a fit and pleasant place for men to work in. In his 'On the Art of Cutting Metals' he lists as one of his discoveries the high advantage of supplying water to cutting tools. Nowhere in Taylor's writings is there any reference to that whole range of problems which is concerned with supplying the workers with safety, or cleanliness, or good lighting, or any of the things which come within scope of industrial hygiene. Because of his preoccupation with the mechanical equipment, Taylor inevitably thought of the workmen almost exclusively in terms of skill, application and production, rather than in terms of personality. In saying this, I want very particularly to avoid the impression that Taylor was lacking in a sensitive regard of the men with whom he worked. We must be historically minded and recall that his books were written twenty-five and thirty-five years ago. The pioneering idea was still strong upon the American community. To be able to do the day's job under rough conditions was a test of the manly virtues."

Mr. Bruere apparently suspects that toward the end of his life Taylor himself began to conceive industrial relations in a sense somewhat resembling that of the present day. "Had Taylor lived, the logic of his own techniques would undoubtedly have led him on to a thorough consideration of all these problems of individual and group psychology as matters of high importance in themselves and having a controlling effect upon economically and socially efficient

production. For this his life was too short. As a matter of fact it was the Taylor Society which took up his educational work, that enlarged the perspective."

It is thus by building upon the Taylor tradition a superstructure of psychology, sociology and ethics that the Taylor Society has made conspicuous contributions to the new science of industrial relations. Throughout its changing philosophy it has insisted that labor management should be closely tied into the productive and distributive processes of industry. This conception is well illustrated by the several chapters on industrial relations in the present book. In his discussion of "Personnel Research," Ordway Tead outlines a number of investigation projects, all closely related to the needs of production. C. S. Yoakum contributes a chapter on "Labor Standards," in which he outlines psychological, trade and aptitude tests that have been found advantageous in fitting workers to the needs of industry. Mr. Tead reenters the forum in a stimulating chapter entitled "The Maintenance of Labor Standards," which really is taken up mainly with a discussion of the labor audit. The book (properly enough, perhaps, in view of its scope) contains only occasional and usually casual references to the more philosophical aspects of personnel administration, such as joint relationships, economic safeguards, and the mutual responsibilities of employers and employees.

In style and content the book manifests less variation among its contributors than is usual in a symposium, thus evidencing the skillful and scholarly editing by Dr. Harlow S. Person.

MANAGEMENT'S HANDMAIDEN

ACCOUNTING FOR EXECUTIVE CONTROL. By Monard V. Hayes. New York: Harper, 1929, 495 pp., $6.00

Reviewed by LEROY E. KIMBALL, *Comptroller, New York University*

The objectives of ACCOUNTING FOR EXECUTIVE CONTROL can best be stated by quoting Mr. Hayes when he says at the end of the second chapter that they are:

1. To set forth a concept of accounting which may serve management as the basis for "control."

2. To discuss ways and means of setting up certain standards in business by which performance may be directed and appraised, and control of a business may be secured.

3. To discuss ways and means of keeping account of certain business accomplishments in terms of standards.

4. To discuss ways and means for accomplishing the following: (a) To determine causes for variation between standards and actual accomplishment. (b) To analyze the causes of variation and interpret them so as to place effectively responsibility and authority for performance. (c) To show how efficiency may be effectively determined for management use.

5. To discuss certain organization methods and procedure for the business enterprise, and to show how authority and responsibility may be effectively placed for purposes of control.

Mr. Hayes, a consulting management engineer with a well known company of management engineers, has incorporated a wealth of material in thirty-two chapters of his book and follows these with fourteen pages of bibliography, by chapters, which in itself should be of solid assistance to those interested in securing leads for further study of the various phases of the subject.

In his foreword, Professor Roy B. Kester says "the accounting office has always been the place where most of the significant financial facts of business have been recorded. To expand its field of activity and function, under the direction of a controller, to include the gathering and preparation of data, not strictly financial but almost

equally significant and important, is in accord with the best modern practice, which makes use of an established agency with a personnel already trained, rather than building up a new with the possibility of duplication. Thus controllership organization has been developed and has proved itself worthy of its trust."

Before dealing with how the controller's office should be organized to perform its duties, the author leads up to it logically with a discussion of the aim of management, the concept of accounting and the agencies necessary for management control. After the control is established, he shows the "services which accounting can make available to the various executives—chief and subordinate—on whom rests the management of a business enterprise."

Mr. Hayes visualizes the person in control as a technician who operates the mechanisms for determining the direction, the rate of speed, the resistances, and the results accomplished in a business enterprise. He believes he should provide the ways and means for the business experiences to be so recorded and so visualized that those charged with the responsibility may know how to operate the business machine at a maximum of efficiency. The tools of the controller are given as: (1) the budget; (2) general accounting; (3) financial accounting; (4) statistics; (5) verification or audit; (6) reports of many kinds.

This book should be equally important to accountants interested in broadening their professional usefulness to include problems of organization, and to executives looking for a clear and full statement of how a control system should function.

LABOR TURNS CAPITALIST

THE LABOR BANKING MOVEMENT IN THE UNITED STATES. Princeton University, Industrial Relations Section, 1929, xi + 377 pp., $2.50

Reviewed by MARGARET G. MYERS, *Columbia University*

When the first labor banks were organized, at the crest of the prosperity which followed the war, they were hailed on the one hand, by labor sympathizers and radicals as a method by which labor was at last to free itself of capitalist domination; and on the other hand, by conservatives who foresaw the end of the "class strugle" as labor turned capitalist. At the same time the movement was opposed by such diverse groups as the old guard of the American Federation of Labor, which insisted that more than labor banking was needed to usher in a strikeless Utopia; and by Communists who viewed the labor bank as just one more red herring across the path of the working class. None of these exaggerated hopes and fears has been justified by the course of events. The number of banks increased between 1920 and 1926, from one to thirty-five, and the total capitalization reached the respectable sum of nine millions. But during the next three years several important banks failed; others passed into the control of non-labor groups, and few new labor banks were organized. By the middle of 1929, the number of banks had been reduced to twenty-two, and the movement seemed to be in a period of slow decline.

This volume is the first impartial attempt to appraise the results of labor banking. The history of every bank is traced from its beginning to its end or its present status, as the case may be. The conclusion, which is almost reluctantly presented by the authors, is that labor banks as a class have not been successful. A few outstanding examples like the Amalgamated Bank of New York, are not sufficient to bring up the average. From the banking point of view, difficulties have arisen from the inexperience of officers and directors, and from the frequent conflict between the interest of sound banking and the interest of the labor group which held control. Many of the banks

have not been able to earn a fair rate of return on their capital, and others have suffered an impairment of capital. Nor have the labor banks been more successful in serving the interests of labor than in making profits as banks. A few instances can be cited, in which a labor bank aided a union during a strike, or loaned to a fair employer, or saved a closed-shop employer who had been unable to borrow from commercial banks. Some of the banks started out with the hope of catering particularly to the banking needs of the workers, by specializing in small loans, or by increasing the interest paid to savings depositors, but most of these special services have had to be abandoned. Labor has secured little in the way of service from its banks, and except for a few cases, nothing in the way of prestige. Such disasters as overtook the banks controlled by the Brotherhood of Locomotive Engineers did serious harm to the cause of labor. On the whole the picture is a discouraging one, and the few bright spots only serve to set the failures in darker relief.

A "MUST" FOR MANAGEMENT

PRESENT DAY LABOR RELATIONS. By Paul F. Gemmil. New York: John Wiley, 1929, vii + 312 pp., $3.00

Reviewed by MEYER BLOOMFIELD, *New York City*

The student of industrial relations always welcomes such a clear and discriminating appraisal of typical employer-employee plans as Dr. Gemmil's book presents. The subject can never be so trite that fresh evaluations, especially in terms of well-selected plans, are likely to be passed by.

From the side of management, however, which needs so much to keep posted and to be intelligent in thinking on this subject there is a curious tidal action as regards an interest in labor relations. There is one type of executive, and the name is not Legion, which, regardless of labor market fluctuations, looks on a sustained program of labor relations as a normal ingredient of management policy. Another type classes an interest of this kind as a luxury when no pressure supervenes, and an emergency, when relationship realities have to be faced. The big problem in modern executive training is how to make such a study as Dr. Gemmil's take its place, where it truly belongs, among the "musts" in managerial practice.

This book is divided into three main sections: Trade Unionism, Employee Representation, and Industrial Democracy. Each is treated with clearness and breadth. A reviewer, however, would at once take himself out of the blessed reviewer guild if he failed to indicate how he would, and how much better he could, have assembled the main topics for this compact study. So merely for franchise purposes, it is recorded here, that perhaps the most significant activity in labor relations today is the system of tribunals known as the Impartial Chairman, now functioning so brilliantly in the vexed ready-to-wear industries. This reviewer would have given almost all the space of the Employee Representation section to a study of these tribunals and their cases and decisions—a study of a labor Common Law in the making.

The fact still remains that Dr. Gemmil has made a contribution to sound thinking and insight. When the tide again turns toward a serious facing of labor relations programs—more generally than is the case when deflations, economic, intellectual and spiritual are the rage—his book will be among the first to be recognized for its industrial rehabilitation helps.

THE INDUSTRIAL HEALTH RESEARCH BOARD OF GREAT BRITAIN

NINTH ANNUAL REPORT OF THE INDUSTRIAL HEALTH RESEARCH BOARD TO DECEMBER 31, 1928. London, His Majesty's Stationery Office, 1929, 33 pp. (9 d.)

(All the reports listed below were published during 1928 and are obtainable at H. M. S. O., London)

TWO CONTRIBUTIONS TO THE EXPERIMENTAL STUDY OF THE MENSTRUAL CYCLE. I. ITS INFLUENCE ON MENTAL AND MUSCULAR EFFICIENCY. By S. C. M. Sowton and C. S. Myers. II. ITS RELATION TO GENERAL FUNCTIONAL ACTIVITY. By E. M. Bedale. Report No. 45. 73 pp. (2 s. 6 d.)

A PHYSIOLOGICAL INVESTIGATION OF THE RADIANT HEATING IN VARIOUS BUILDINGS. By H. M. Vernon and M. D. Vernon, assisted by Isabel Lorrain-Smith. Report No. 46. 60 pp. (2 s. 0 d.)

TWO STUDIES ON HOURS OF WORK: I. FIVE-HOUR SPELLS FOR WOMEN, WITH REFERENCE TO REST PAUSES. By H. M. Vernon and M. D. Vernon, assisted by I. Lorrain-Smith. II. THE TWO-SHIFT SYSTEM IN CERTAIN FACTORIES. By May Smith and M. D. Vernon. Report No. 47. 35 pp. (1 s. 3 d.)

ON THE RELIEF OF EYESTRAIN AMONG PERSONS PERFORMING VERY FINE WORK. By H. C. Weston and S. Adams. Report No. 49. 31 pp. (1 s. 3 d.)

THE PHYSIOLOGICAL COST OF THE MUSCULAR MOVEMENTS INVOLVED IN BARROW WORK. By G. P. Crowden. Report No. 50. 24 pp. (1 s. 0 d.)

A STUDY OF ABSENTEEISM IN A GROUP OF TEN COLLIERIES. By H. M. Vernon and T. Bedford (assisted by C. G. Warner), Report No. 51. 68 pp. (2 s. 6 d.)

THE COMPARATIVE EFFECTS OF VARIETY AND UNIFORMITY IN WORK. By S. Wyatt and J. A. Fraser. Report No. 52. 36 pp. (1 s. 3 d.)

THE USE OF PERFORMANCE TESTS OF INTELLIGENCE IN VOCATIONAL GUIDANCE. By F. M. Earle, M. Milner and others. Report No. 53. (2 s. 6 d.)

AN INVESTIGATION INTO THE SICKNESS EXPERIENCE OF PRINTERS (WITH SPECIAL REFERENCE TO THE INCIDENCE OF TUBERCULOSIS). By A. Bradford Hill. Report No. 54. (4 s. 6 d.)

Reviewed by LELAND W. CRAFTS, *New York University*

The Industrial Health—formerly the Industrial Fatigue—Research Board of Great Britain continues to be the most elaborate and the most intensive existing enterprise for the study of the psychological and physiological problems that arise in industry. Its published contributions to the research problems which the Board had under investigation during the year 1928 will be briefly described and its plans for the immediate future indicated.

Effect of menstruation upon the working capacity of women. Two studies deal with the relation of the menstrual cycle to the working capacity of women. In one investigation various tests of mental and muscular efficiency were given daily, over periods of from six to nine months, to a group of university students and factory operatives ranging in ages from 17 to 22 years. In the other, systematic observations of basal-metabolism, body temperature, blood pressure and pulse rate were made on a single subject for a period of three months. The combined results of these two studies indicate that while in some individuals slight variations in efficiency and activity do occur during the menstrual cycle, the phenomenon has as a rule no appreciable effect on the working capacity of normal healthy women. Hence the important practical conclusion that whatever may be the disadvantages suffered by women in comparison with men in industry, the periodic occurrence of menstruation is not one of them.

Hours of work for women. Two researches in this field also have been completed. In one the efficiency of an unbroken five-hour spell in such factory work as packing tea, making biscuits and confectionery, labelling, tying packages and hemstitching was investigated. As might be expected it was found that the introduction of a rest pause of 10 to 15 minutes at the middle of the spell measurable increased output and—what was equally important—greatly decreased labor turnover. The second study deals with the effects on rate of output, loss of working time, absenteeism, sickness and labor turnover of the two-shift system. Under this system women may be employed between 6 a.m. and 10 p.m. in two shifts averaging not more than eight hours each, as compared with a working day of 8 a.m. to 5 p.m. The few data thus far assembled suggest that neither system has any advantage over the other.

Relief of eye strain in very fine processes. Investigation into the value of having specially constructed glasses worn by employees whose work demands fineness of visual discrimination and close vision, specifically in the processes of mounting lamp filaments by hand and drawing-in weaving, has been continued, and again their value has been effectively demonstrated. Output was increased on the average about 12 per cent, an amount which more than offsets the cost of the glasses, and the opinions of the workers themselves were favorable without exception. In many industries there are operations, such as, embroidering, burling and mending woollen cloth, examining finished products for minute defects, in which under ordinary conditions the eyestrain suffered may be considerable. The above results should suffice to persuade employers that there exists here a situation which could be remedied by a very small expenditure and with distinct advantage to themselves.

Efficiency in barrow work. A research on the energy expenditure, measured in terms of excess of oxygen consumed, in wheeling bricks has been completed. The results show that, with a barrow of a certain particular design, maximum efficiency depends on the arrangement as well as the weight of the load, on the length of uninterrupted runs (since starting and stopping the barrow consume a great amount of energy), on the height of the handle relative to the worker's stature, and on the speed of wheeling, the most favorable rate being a brisk walk. Hence, even in such simple muscular work as this, worth-while economies could be effected by attention to differences in the physique of individual workers and by definite instruction of the latter in those "best methods" of work which this investigation has shown to exist.

Variety vs. uniformity in work. In this research two problems were investigated: the effect upon output of varying vs. uniform procedure among girls working at soap wrapping, handkerchief folding and bicycle chain "drifting;" and the optimum duration of unvaried activity in tobacco weighing and cigarette making, which are correlated processes commonly performed by a pair of operatives each of whom changes places at times with the other. The results indicate that an unvarying procedure is less productive and also causes increased irregularity in the rate of work. The highest output was obtained when the form of activity was changed every one and one-half or two hours, and in repetitive work of a distinctly fatiguing nature such changes should be even more frequent. However variations thus introduced must not be too frequent and must not interfere with the "swing" of the occupation. It seems fair to conclude, therefore, that we have here a problem whose solution, though clear enough in general principle, would differ in its actual details in different types of work.

Methods of heating. The work in this field during the past year has dealt with the physiological effects of certain forms of radiant heating, particularly of the widely used panel heating in which concealed coils of hot water pipes run in the ceiling, walls or floor of the room. The results suggest that the chief advantage of such heating is the remarkable uniformity of room temperature induced by the radiation of heat in all directions from large surfaces which themselves need be maintained at only a moderate temperature. Such systems do not, however, possess any inherently advan-

tageous qualities such as would, for example, enable them to bring about comfortable conditions at lower air temperatures than other devices could.

Absenteeism among miners. A statistical study has been made of the records of absenteeism over periods of 21 months to 6 years of some 23,000 miners working underground in a group of ten collieries in the same district. The data show that absence, whether voluntary or due to sickness and accident, is influenced by the temperature and air velocity in the pits, the age of the worker, the distance of his home from the mine, etc. The conclusions are, however, only tentative and further investigations are planned.

Sickness among printers. The incidence of sickness in the printing industry was determined and found to compare favorably with that among the insured working population in general. Within the industry itself, however, it was discovered that among compositors illness was exceptionally prevalent during the first few years of insured employment. Further investigation must determine whether this high sickness rate is due to the employment of individuals of poor physique or to unfavorable working conditions.

Vocational guidance. Another research recently published deals with the use of performance tests of intelligence. Such tests were given to large numbers of children and the results subjected to statistical analysis. The relation between the test scores and success in certain manual trades is indicated.

In addition to summaries of the investigations reviewed above the 9th Annual Report of the Industrial Health Research Board calls attention to many researches now in progress. Among these are studies of the effect on working efficiency of illumination, noise and vibration, and humidity; investigations into the causes of accidents, labor turnover and sickness in various industries; data as to the incidence of neuroses among the working population; studies of the physique of men in industry; derivation of learning curves for different occupations; the development and application of tests for vocational guidance and selection; laboratory experiments in energy expenditure during muscular work in women, transfer of training, and the relation of age to the acquisition of skill. The Board now feels, and quite rightly, that its researches have already yielded conclusions possessing both scientific certainty and practical worth. Hence it recommends that in each industry a committee representative of both employers and workmen should be formed for the purpose of examining and applying the results of its work and for suggesting further problems. Such a step would of course greatly increase the scope and importance of its activities.

Briefer Mention

THE FIVE-DAY WEEK IN MANUFACTURING INDUSTRIES. New York: The Nat'l Indus. Conf. Bd., 1929, xi plus 69 pp., $1.50.

The five-day week is a question not only of social reform but of individual factory management, and it is of the latter that this volume reports. The change to a five-day schedule involves many problems of administrative policy. Some of the establishments have retained the same number of working hours as under the former full week schedules; the greater number reduced the hours, but only one-fourth reported any decrease in production. The adjustment of wage scales had depended upon conditions in the individual plant.

Among the positive advantages of the five-day week, employers have found reduced overhead costs, operating economies, smaller labor turnover, and improved morale. The chief disadvantage has been the longer working day which resulted when the former length of working week was retained and divided among the five days of the new schedule. Employees are uni-

formly in favor of the five-day week, and employers are seldom opposed to it after a trial unless it was forced upon them by a labor union against their will.

INVESTMENT TRUST ORGANIZATION AND MANAGEMENT (Rev. Ed.) By Leland Rex Robinson. New York: Ronald, 1929, xvii plus 608 pp., $7.50.

This book, although originally published in 1926, has been completely re-written. It contains descriptions of the various kinds of investment trusts, the laws under which they are organized, and a brief summary of the investment trust movement in America. For the practical guidance of those who are organizing or managing such trusts, there are chapters on the problems of investment policy, the handling of securities, accounting, and taxation. For the general investing public, there are chapters on capital structure, forms of securities issued, earnings, and other subjects which should enable them to compare one investment trust with another, and choose their investment trust securities more wisely.

THE POST-WAR UNEMPLOYMENT PROBLEM. By Henry Clay. London: Macmillan, 1929, x plus 208 pp., $3.40.

Post-war unemployment in England is largely a legacy of the war, the principal factors being the deflation policy of the Government which accompanied the return to the Gold Standard, and the dislocation of industry brought about by the war's interference with the export trades. Building subsidies and protective tariffs cannot bring about a permanent solution, and a new inflation would merely postpone it. What is needed is "rationalisation" of industry, by which industrial combinations are achieved with the object of securing productive economies and thus reducing costs, enabling England again to compete in the international markets. Labor costs must be reduced, not by reducing wages, but by removing restrictions on output, and so forth. Rationalisation should first be applied to the coal industry, which has been one of the heaviest sufferers from unemployment. If private enterprise has not the will to apply the remedy, the Government will be obliged to step in.

MEXICAN LABOR IN THE UNITED STATES. By Paul S. Taylor.

1. Imperial Valley. 94 pp., $1.15.

2. Valley of the South Platte. 141 pp., $1.80.

3. Migration Statistics. 18 pp., $.25.

Berkeley, California: Univ. of Cal. Press, 1929.

In the first two of these monographs, the place of the Mexican laborers in the fruit farms and cotton fields of the Imperial Valley, and the beet fields of northeastern Colorado, is described with special reference to their position in the community. The problem of Americanizing them and getting their children into schools, is made difficult not only by their own indifference, but also by the contemptuous disregard of their American neighbors. Social and economic isolation is the lot of these workers.

The third monograph analyzes and criticizes the statistics of Mexican immigration into the United States, and points out the dangers of basing immigration legislation upon such faulty data.

UNEMPLOYMENT INSURANCE IN GERMANY. By Mollie Ray Carroll. Washington: Brookings Inst., 1929, x plus 137 pp., $2.00.

The new German law of 1927 provided unemployment insurance for workers in many specified industries, up to a maximum of twenty-six weeks of unemployment. Contributions to the fund are compulsory for employers and employees, but may not exceed one and one-half per cent of wages from each side. Special assistance is given from the public treasury when necessary. The Act is administered through local labor exchanges created by it, which keep close supervision over the unemployed worker and make every effort to provide him with a job. The benefits range from thirty-five to seventy-five per cent of the average weekly wage, with supplementary allowances made for dependents. In spite of the care with which the Act was drawn, many difficulties have arisen in its application, especially in connection with the seasonal industries. Unemployment insurance is an essential safeguard to the worker, but it cannot solve the larger questions which depend upon the development of markets and improvements in industrial management.

THE HISTORY OF ECONOMICS. By Othmar Spann. (Trans. from the German by Eden and Cedar Paul) New York: Norton, 1930, 328 pp., $3.50.

This volume by the Professor of Sociology and Economics at the University of Vienna, went through nineteen editions in Germany, and may be taken as representative of a large body of current economic opinion on the Continent. Although it discusses the different historical schools of economic theory, it has a very definite attitude of its own. Protest is voiced against the individualism of the "natural rights" school with its justification of ruthless competition, and against the current emphasis upon the pecuniary aspects of economic life. Opposite the title page the author has written: "Political Economy is not a Science of Business but a Science of Life."

A NEW ECONOMIC ORDER. Edited by Kirby Page. New York: Harcourt, Brace, 1930, 387 pp., $3.00.

The book opens with debates on the four most discussed forms of economic organization—capitalism, socialism, communism, and Fascism. Two chapters are devoted to different theories of the technique of social reform, and the rest of the book is devoted to "Ways of Transforming the Present Competitive System into a Coöperative Order," which is assumed to be the social desideratum. Each of the fourteen "ways" is discussed by an expert in his field; among them are the minimum wage and family allowance, social insurance, workers' education, and trade unionism.

IMPERIALISM AND WORLD ECONOMY. By Nikolai Bukharin. New York: Int'l. Pub., 1929, 173 pp., $2.00.

This essay, which bears an introduction by Lenin, is a study in Marxian economics. Imperialism is defined as an extension of the principles of capitalist development to international growth. The existence of world commodity markets and world capital markets is cited as evidence that the Marxian theory applies to international as well as to national events. The whole essay is an example of how the Communist formula may be applied to almost any subject.

ASPECTS OF EUROPEAN ECONOMICS AND RECONSTRUCTION. By William H. Scheifley. Los Angeles: Wetzel, 1929, 310 pp., $3.00.

This collection of short articles appeared originally in 1926 and 1927, in the Chicago Journal of Commerce and the Boston Transcript. They describe the important economic events which were taking place in Europe during those years—stabilization of the currency in Germany, the general strike in England, the effort to balance the budget in France, and the industrial advance being made in Italy and Spain. Russia is the only important country omitted.

New Books

LABOR RELATIONS

CAPITALISM, SOCIALISM, COMMUNISM? By E. R. A. Seligman, Fenner Brockway, Scott Nearing. New York: Rand, 1930, 64 pp., 50¢.

INDUSTRIAL ARBITRATION IN GREAT BRITAIN. By Lord Amulree. New York: Oxford, 1930, x + 224 pp., $4.50.

THE IMPERIALIST WAR, THE STRUGGLE AGAINST SOCIAL-CHAUVINISM AND SOCIAL-PACIFISM, 1914–1915. By Nikolai Lenin. New York: Int'l. Pub., 1930, 496 pp., $4.50.

REDS AND LOST WAGES. By Charles G. Wood. New York: Harper, 1930, 295 pp., $4.

OCCUPATIONAL ANALYSIS

ACOUSTICS OF BUILDINGS (2nd ed.). By F. R. Watson. New York: Wiley, 1930, 155 pp., $3.

AVIATION AND LIFE INSURANCE: A STUDY OF THE DEATH RATE AND THE HAZARD OF FLYING IN RELATION TO POLICY UNDERWRITING. By Ray A. Dunn. U. S. A. Air Corps, 1930, 112 pp.

Is It Safe to Work? By Edison L. Bowers. Boston: Houghton, 1930, 242 pp., $2.50.

Women and the Ph.D.: Facts from Experiences of 1025 Women Who Have Taken the Degree of Doctor of Philosophy Since 1877. By Emilie J. Hutchison. Greensboro: N. C. Col. for Women, 1930, 212 pp., $1.

COLLEGE PERSONNEL

Quantitative Measurement in Institutions of Higher Learning. By Stuart A. Courtis, ed. Chicago: U. of Chicago, 1930, 262 pp., $1.50.

University and College Accounting. By Lloyd Morey. New York: Wiley, 1930, 323 pp., $6.

GUIDANCE (VOCATIONAL AND EDUCATIONAL)

How to Read Books. By Llewellyn Jones. New York: Norton, 1930, 229 pp., $2.50.

Principles of Guidance. By Arthur J. Jones. New York: McGraw, 1930, 385 pp., $3.

Which College? (rev. ed.). By Rita S. Halle. New York: Macmillan, 1930, ix + 249 pp., $2.50.

MENTAL HEALTH

Adolescence: Studies in Mental Hygiene. By Frankwood E. Williams. New York: Farrar, 1930, 290 pp., $2.50.

MANAGEMENT AND ADMINISTRATION

Alfred Weber's Theory of the Location of Industries (English ed. by Carl Joachim Friedrich). By Alfred Weber. Chicago: U. of Chicago, 1930, 289 pp., $3.

Credit: The Magic Coin of Commerce. By Maxwell Droke. Indiana: Business Letter Inst., 1930, 205 pp., $3.50.

Operating Aspects of Industrial Mergers. By William R. Basset and Johnson Heywood. New York: Harper, 1930, 214 pp., $3.

Problems in Industrial Accounting (2nd ed.). By Thomas H. Sanders and Paul B. Coffman. New York: McGraw, 1930, xi + 811 pp., $6.

The Art of Business Thinking. By H. G. Schnackel. New York: Wiley, 1930, xix, + 147 pp., $2.50.

The Technique of Executive Control (3rd ed.). By Erwin H. Schell. New York: McGraw, 1930, 167 pp., $2.

INDUSTRIAL EDUCATION

History and Organization of Education in Pennsylvania (2nd ed.). By Louise G. Walsh and Matthew J. Walsh. Pennsylvania: State Teachers' Col., 1930, 428 pp., $3.25.

VOCATIONAL INFORMATION

Athletics of Today: History, Development and Training. By F. A. M. Webster. New York: Warne, 1930, $5.

Brickwork and Its Construction; A Text-Book for All Workers in Brick. By Walter R. Jaggard. New York: Oxford, 1930, 330 pp., $6.

Business Law. By Earl S. Wolaver. New York: McGraw, 1930, xii + 455 pp., $4.

Clayworker's Handbook (4th ed.). By Alfred B. Searle. Philadelphia: Lippincott, 1930, 383 pp., $10.

Electric Wiring; A Textbook of Applied Electricity for Vocational and Trade Schools (new 2nd ed.). By Albert A. Schuhler. 380 pp., $2.50.

Elements of Electricity. By Anthony Zeleny. New York: McGraw, 1930, 438 pp., $3.

Engineering of Antiquity and Technical Progress in Arts and Crafts. By George Zimmer. Milwaukee: Caspar, 1930, 112 pp., $3.

George Eastman. By Carl William Ackerman. Boston: Houghton, 1930, xviii + 495 pp., $5.

Introduction to Modern Journalism. By Stewart Robertson. New York: Prentice-Hall, 1930, 389 pp., $2.50.

Men Who Found Out: Stories of Great Scientific Discoverers. By Amabel Williams-Ellis. New York: Coward, 1930, 259 pp., $2.

Practical Radio Construction and Repairing (2nd ed.). By James A. Moyer and John F. Wostrel. New York: McGraw, 1930, 353 pp., $2.50.

Printing. By E. G. Porter. New York: Pitman, 1930, 96 pp., $1.

Spinning, Weaving and Finishing of Flax and Jute. By Thomas Woodhouse

and Peter Kilgour. New York: Pitman, 1930, 250 pp., $3.

THE COUNTRY NEWSPAPER AND ITS OPERATION. By James Safley. New York: Appleton, 1930, vii + 383 pp., $3.

THE STUDENT'S HISTORY OF PRINTING. By Merritt W. Haynes. New York: McGraw, 1930, 107 pp., $1.40.

WOMEN IN GAINFUL OCCUPATIONS, 1870 TO 1920. By Joseph A. Hill. Washington: G. P. O., 1930, 432 pp., $1.50.

PSYCHOLOGY

MIND AT THE CROSSWAYS. By C. Lloyd Morgan. New York: Holt, 1930, 286 pp., $3.75.

PILOTING YOUR LIFE: THE PSYCHOLOGIST AS HELMSMAN. By Joseph Jastrow. New York: Greenberg, 1930, 388 pp., $3.50.

PSYCHOLOGY AND RELIGION. By John Pitts. New York: Revell, 1930, 110 pp., $1.25.

PSYCHOLOGY FOR STUDENTS OF EDUCATION (rev. ed.). By A. I. Gates. New York: Macmillan, 1930, 627 pp., $2.25.

PSYCHOLOGY IN BUSINESS RELATIONS (2nd ed.). By A. J. Snow. New York: McGraw, 1930, 529 pp., $5.

REFLEX ACTION: A STUDY IN THE HISTORY OF PHYSIOLOGICAL PSYCHOLOGY: By Franklin Fearing. Baltimore: Williams & Wilkins, 1930, xiii + 350 pp., $6.50.

SEXUAL ABERRATIONS: THE PHENOMENA OF FETISHISM IN RELATION TO SEX, 2 vols., (trans. by S. Parker). By Wilhelm Stekel. New York: Liveright, 1930, 378 pp., $10.

THE AUTOBIOGRAPHY OF A CRIMINAL (ed. by Edmund Pearson). By Henry Tufts. New York: Duffield, 1930, xvii + 343 pp., $3.

THE NEW GENERATION, THE INTIMATE PROBLEMS OF MODERN PARENTS AND CHILDREN. By V. F. Calverton and Samuel D. Schmalhausen. New York: Macaulay, 1930, 717 pp., $5.

THE STRUCTURE AND MEANING OF PSYCHOANALYSIS, AS RELATED TO PERSONALITY AND BEHAVIOR. By William M.D. Healy and others. New York: Knopf, 1930, 523 pp., $5.

ECONOMICS

AMERICA LOOKS ABROAD: THE NEW ECONOMIC HORIZONS. By Paul M. Mazur. New York: Viking, 1930, x + 299 pp., $3.

AN INTRODUCTION TO THE MONEY AND BANKING SYSTEM OF THE UNITED STATES. By John P. Day. New York: Macmillan, 1930, viii + 120 pp., $1.60.

ELEMENTARY ECONOMICS; 2 vols. (rev. ed.). By Fred R. Fairchild and others. New York: Macmillan, 1930, 627 pp., $2.50.

INVESTMENTS TRUSTS—HOW AND WHY. By Israel B. Leibson. New York: Financial Pub. Co., 1930, 92 pp., $2.

OUR WANTS AND HOW THEY ARE SATISFIED. By Mollie R. Carroll. Boston: Barrows, 1930, 81 pp., $1.

OUTLINES OF ECONOMICS (5th rev. ed.). By Richard T. Ely and others. New York: Macmillan, 1930, 886 pp., $3.

SOVIET ECONOMIC DEVELOPMENT AND AMERICAN BUSINESS: RESULTS OF THE FIRST YEAR UNDER THE FIVE-YEAR PLAN, AND FURTHER PERSPECTIVES. By Saul G. Bron. New York: Liveright, 1930, 99 pp., $1.50.

STATISTICAL TABLES AND GRAPHS. By Bruce D. Mudgett. Boston: Houghton, 1930, 202 pp., $1.75.

STOCK SPECULATION AND BUSINESS. By George L. Hoxie. Boston: Stratford, 1930, 69 pp., $1.

THE ECONOMICS OF BRANCH BANKING. By Bernhard Ostrolenk. New York: Harper, 1930, 219 pp., $3.50.

WOMEN WORKERS AND THE INDUSTRIAL REVOLUTION, 1750–1850. By Ivy Pinchbeck. New York: Crofts, 1930, 352 pp., $5.

SOCIOLOGY

AMERICAN SEX PROBLEMS. By Dinshah P. F. Ghadiali. Malaga, N. J.: Spectro-Chrome Inst., 1930, 242 pp., $3.

LOVE IN THE MACHINE AGE: A PSYCHOLOGICAL STUDY OF THE TRANSITION FROM PATRIARCHAL SOCIETY. By Floyd Dell. New York: Farrar, 1930, 435 pp., $3.50.

MRS. GRUNDY. By Leo Markun. New York: Appleton, 1930, 677 pp., $5.

PROCEEDINGS OF THE NATIONAL CONFERENCE OF SOCIAL WORK (56th Annual Session). Chicago: U. of Chicago, 1930, 666 pp., $3.

SOCIAL AND INDUSTRIAL CONDITIONS IN THE NORTH DURING THE CIVIL WAR. By Emerson D. Fite. New York: Peter Smith, 1930, 318 pp., $3.75.

THE DANGERS OF OBEDIENCE, AND OTHER ESSAYS. By Harold J. Laski. New York: Harper, 1930, 293, pp., $3.

THE FINANCIAL ORGANIZATION OF SOCIETY (3rd ed.). By Harold G. Moulton. Chicago: U. of Chicago, 1930, 790 pp., $4.

WHAT THE WAGE-EARNING WOMAN CONTRIBUTES TO FAMILY SUPPORT. By Agnes L. Peterson. Washington: Women's Bureau, 1930, 24 pp., 5¢.

PHILOSOPHY

THE REVOLT AGAINST DUALISM: AN INQUIRY CONCERNING THE EXISTENCE OF IDEAS. By Arthur O. Lovejoy. New York: Norton, 1930, 337 pp., $4.

Current Periodicals

PREPARED BY LINDA H. MORLEY, *Industrial Relations Counselors, Inc.*

COLLEGE MEN IN BUSINESSS

MILLER, ARTHUR P. (Specialty Sales Manager, Aluminum Cooking Utensil Company). Placement and follow-up of college men. *Personnel*, May, 1930, Vol. 7, p. 9–12.

Presented at the Pittsburgh Personnel Association Dinner, April 1, 1929.

Company employs from 1500 to 2000 college salesmen each year as summer representatives. Work card is kept for each salesman, and any particular aptitude is noted. Prefer to make the contact first during sophomore or junior year. Training classes start in April.

ECONOMICS

GRAS, N. S. B. (Professor of Business History, Graduate School of Business Administration, Harvard University). Stages in economic history. *Journal of Economic and Business History*, May, 1930, Vol. 2, p. 395–418.

Economists have used economic stages as summaries of past development. Earliest ones of hunting, pastoral and agricultural pursuits go back to Dicaearchus of the 4th Century B. C. The economic stages are conditions rather than periods and occur at different times in different countries. They are not true or final, but are temporarily significant and important. Author discusses the use of "stages" by well known economists in historical sequence—Roscher, Bücher, Schmaller and others in their work.

EMPLOYMENT STATISTICS

CROXTON, FRED C., (Department of Industrial Relations of Ohio), and CROXTON, FREDERICK E. Fluctuation of employment in Ohio, 1924 to 1928, and an estimate of unemployment of males. *Monthly Labor Review*, April, 1930, Vol. 30, p. 745–780.

Statistical information concerning fluctuation of employment in establishments employing 3 or more persons, in agriculture, construction, fisheries, manufactures, mining and quarrying, service, wholesale and retail trade, and transportation and public utilities. Tables show fluctuation of employment of males and females in each industry. Department of Industrial Relations of Ohio has recently drawn up plans for stabilizing industry and employment by stimulation of public building, improvement of public employment offices, stabilization of employment in individual plants and industries, and study of extent and causes of unemployment.

FATIGUE

INTERNATIONAL LABOUR OFFICE. Fatigue tests. *Occupation and Health*, Brochure No. 187. 1930, 3 pp.

Fatigue tests comprise different methods of measuring industrial fatigue. They may be divided into (1) Direct Tests, which include physiological, chemical and psychological tests; (2) Indirect Tests, which include the industrial tests, output, spoilt work, lost time, quality of work, motive power, etc. Industrial tests are much more difficult to carry out, and harder to interpret.

INDUSTRIAL RELATIONS

BRUERE, HENRY (1st V. Pres., Bowery Savings Bank). Bank employees and the bank. *Personnel*, May, 1930, Vol. 7, p. 17–25.

Fundamental purpose of employing staffs and training them is to have business done efficiently. The N. Y. savings

banks serve more than 60 per cent of the population and the employees must have good manners, a respect for those in command, a knowledge of the business and dependability of judgment. With the help of the Personnel Department, and a Conference Committee of Employees, mutually beneficial activities are carried on in the Bowery Savings Bank.

CHAPPLE, BENNETT, (V. Pres., The American Rolling Mill Co.) Advertising department as a builder of employee morale. *Printers' Ink*, May 8, 1930, Vol. 151, p. 137–138.

"Ten services performed by the Armco advertising department not ordinarily viewed as advertising activities."

CIVIL SERVICE ASSEMBLY OF THE UNITED STATES AND CANADA. Summary of the proceedings of the twenty-second annual meeting. *Public Personnel Studies*, September–October, 1929, Vol. 7, entire issue.

Reports of the following sections and committees are included: Technical Section on the Organization of the Administrative Units of a Government; Technical Section on Coöperative Action with Civic Organizations; Technical Committee on Training Courses; Technical Committee on Classification and Compensation Plans; Technical Committee on Recruiting for Scientific Positions; Technical Committee on Layoffs and Reëmployment.

GREENE, JAMES H., (Manager, Coöperative Department, The Studebaker Corporation). "Coöperative Department"—a new name for "Industrial Relations." *Printers' Ink*, April 10, 1930, Vol. 151, p. 146–153.

New name carries no implication of industrial paternalism. Scope of activities identical with that of industrial relations or personnel department. "Co-operative Plans" are published anually in a booklet including suggestions, service medals, etc., and general statements concerning policy of the organization. Aim of department is to provide a leadership which will enable employees to enjoy happy working conditions, which in turn will create efficient workers and a superior product.

JOHNSTON, G. A., and SPATES, T. G. Industrial relations in the London Traffic Combine: I, II. *International Labour Review*, April, May, 1930, Vol. 21, p. 494–518; 613–642.

"Traffic Combine" is used to denote transport companies controlled either directly or indirectly by the Underground Electric Railways Company of London, Ltd. Article deals with scope and character of the work of the Combine, and the organization and administration of industrial relations, covering wages, hours and general conditions of service, training, pensions, accident prevention, etc.

KENDALL, HENRY P., (Pres., Kendall Co.) Development of the art and science and philosophy of management since Taylor. *Society of Industrial Engineers Bulletin*, April, 1930, Vol. 12, p. 4–9.

In this opening address at the National Management Congress the President of the Taylor Society summarizes Taylor's principles and philosophy and reviews some of their applications which are to be found today in all well-run industries.

RORTY, MALCOLM C., (V. Pres., International Telephone and Telegraph Corporation, New York) Men—not things. *Bulletin of the Taylor Society*, April, 1930, Vol. 15, p. 99–106.

Science of management deals with methods; art of management deals primarily with men. Problem of humanizing industry is a growing one. Essential point to recognize that the corporation that secures unity of purpose in a loyal federation of leaders, working under a trusted chief, will always win in competition with organization that ranks the science of man above the art—that values things above men.

JOB ANALYSIS

HOPWOOD, J. O., (Superintendent of Employment, Philadelphia Electric Company) Philosophy of labor. *Society of Industrial Engineers Bulletin*, April, 1930, Vol. 12, p. 10–30.

The principles and underlying philosophy employed in setting up occupational classifications for the Phila. Electric Co.

Classification and rating scales are given for some departments as illustrations of his practice as well as sample job specifications which illustrate the method of job analysis used.

LABOR LEGISLATION

WITTE, DR. EDWIN E. Injunctions in labour disputes in the United States. *International Labour Review*, Mar., 1930, Vol. 21, p. 315–347.

A study based on a detailed analysis of the more important labor cases in which injunctions have been issued. It examines many aspects of the question, and throws light on the complexities of what he considers one of the serious industrial problems in the U. S.

MENTAL HYGIENE

LAUGHEAD, MARY B. (M. S. S. (Smith) Psychiatric Social Worker, Clinic Assistant, Department of Employment and Placement, R. H. Macy and Company). Psychiatric social worker in mercantile life. *Annals of the American Academy of Political and Social Science*, May, 1930, Vol. 149, part 3, p. 160–166.

A number of "cases" are presented and results of department procedures outlined. The author thinks the psychiatric social worker has opportunity in a department store of analyzing the personality make-up and the potentialities of an individual for a given job and also for applying constructive treatment to individuals who may be misfits.

LOVEKIN, OSGOOD S., (Department of Industrial Research, Harvard Graduate School of Business Administration, Boston, Mass.) Quantitative measurement of human efficiency under factory conditions. *Journal of Industrial Hygiene*, March–April, 1930, Vol. 12, p. 99–119; 153–167.

Results of experimental study on blood pressures and pulse rates in a number of different laboratory and factory situations to establish standard and give correlations that could be applied under actual factory conditions.

OCCUPATIONS

ECKLER, A. ROSS. Occupational changes in the United States, 1850–1920, *Review of Economic Statistics*, May, 1930, Vol. 12, p. 77–89.

Six main groups are chosen for detailed study because the lines of demarcation in census figures are sufficiently clear to avoid error. These are: primary production (including farmers, miners, etc.), manufacturing, trade, transportation, professional service, and domestic and personal service. Charts show the relationships between groups from 1850 to 1920.

RETAIL CREDIT COMPANY. Synthetic ammonia. *Industry Report*, April, 1930, Vol. 5, p. 39–47.

Occupational descriptions in nitrogen fixation processes. This series of reports is useful as a basis for job classification as well as to the safety man.

PROMOTIONS AND TRANSFERS

HAMMILL, RALPH M., (M.D., President, Illinois Society for Mental Hygiene), and Sharpe, Agnes A. Do men want responsibility? *Factory and Industrial Management*, Feb. 1930, Vol. 79, p. 304–306.

Industrial efficiency depends on utilization of man's desire to be recognized as an important and useful part of the working group. A scientifically planned procedure of promotions within an industry makes for coöperative effort on the part of the workers and management and keeps the employees developing their power of initiative.

SCIENTIFIC MANAGEMENT

CLARK, WALLACE (Consulting Management Engineer). American management methods in an European car shop. *American Machinist*, March 27, 1930, Vol. 72, 4 p. Reprint.

Gives example of a car shop, employing about 3,000 workmen. First step was to show each foreman how to plan his work one day in advance. Soon became apparent that better methods could be used. Value of the production for the year has

increased one million dollars over preceding year, and earnings of workers have increased. Does not give name of company.

SELECTION OF EMPLOYEES

EVERITT, GEORGE B. (Pres., Montgomery Ward). How Montgomery Ward builds retail store personnel. *Printers' Ink*, March 27, 1930, Vol. 150, p. 33–34, 36, 41–42.

Long apprenticeship idea gets a jolt when Ward assembles 10,000 retail store employees in two years.

UHRBROCK, RICHARD S. (Department of Hotel Administration, Cornell University). Where we look for good workers. *Nation's Business*, May, 1930, Vol. 18, p. 84–92.

Explains methods of hotel chain personnel department in filling the many specialized positions in hotels. Standard sources like colleges and schools, "help wanted" ads, labor scouts and employment bureaus, both public and private, are used along with bonus to old employees for recommending persons who stay six months or more; letters to placement bureaus of lodges, unions and other organizations. Cards of introduction to the personnel department are sent to stockholders, settlement houses and ministers and given to employees of lodging and boarding houses in neighborhood who have friends out of work. Both handicapped and cured patients discharged from hospital have been successfully placed through coöperation of hospital officers. Mentions one kitchen crew of deaf and dumb men which has broken record for length of service on job noted for high turnover.

TRAINING

ADAIR, R. G. (Supervisor, Safety and Training, The American Rolling Mill Co.) Foreman training that works. *Factory and Industrial Management*. May, 1930, Vol. 79, p. 1103, 1105, 1107, 1109.

Part I: Preventing waste of labor.

Poor planning, failure to transmit clear and complete directions, failure to improve the working technique of the men, high labor turnover, and inability of supervisors to interpret cost sheets, all waste many dollars, by cutting down productivity. Armco is considering the establishment of a minimum standard which a man must meet, before he can be promoted to supervisory jobs.

COFFIN, VINCENT B. (Director of Education, The Penn Mutual Life Insurance Company). Measuring the results of training salesmen. *Personnel*, May, 1930, Vol. 7, p. 12–16.

Presented at Round Table Conference on Training Salesmen, held at Cincinnati, April 5, 1929.

Results are tangible, the dollar and cents results; and the intangible as important but not measurable. Experience has been in two fields, New York University (11 week course in insurance salesmanship) and the other in Penn Mutal Life Insurance Company. One result is lessening turnover of salesmen. Greatest single attribute of the course is the increased confidence in the salesmen.

FARRINGTON, F. B. (General Manager, Factory Service Division, The B. F. Goodrich Rubber Co.). Goodrich apprenticeship means an adequate training. *Trained Men*, Midwinter, 1930, Vol. 10, p. 7–10.

Mass production methods in the rubber industry have not eliminated the need for all-round mechanics. The B. F. Goodrich Company train their apprentices to be skilled mechanics, and have found that the program, including study-room period on company time, is more than paying its own way.

ROSS, DANIEL (Chief, Payroll Dept., John A. Roebling's Sons Co.). Foremen go to night school. *Iron Age*, April 10, 1930, Vol. 125, p. 1059–1060.

"Roebling Organization now engaged in fourth year of specialized educational effort which has resulted in many tangible evidences of value." Economies have effected, better human relations have been established, general policies of the company have been more accurately interpreted in the affairs of every day, greater pride manifested in production, evidences of increased loyalty abound,

and a noticeable reduction in waste has occurred." None of the education has been compulsory. Class this year three times the size of first year's group.

UNEMPLOYMENT

KNOEPPEL, C. E. (Cleveland). Worker and mechanized industry. *Society of Industrial Engineers Bulletin*, March 1930, Vol. 12, p. 7–18.

Discussion of Technological Unemployment, caused by machines and age limitations, which is considered the greatest single problem confronting the country industrially. Outlines of "Case material evidence of displacements," and "Quantitative evidences of displacement" are given. Constructive recommendations are to spread the gospel of high wages at low unit costs, through research and waste elimination; by bridging the gap between displacement and absorption, etc. We are not witnessing anything new, just dealing with logical "acceleration." Suggests that we accept the machine, but declare war on technological unemployment.

AMIDON, BEULAH. Civic front on unemployment. *Survey*, May 15, 1930, Vol. 64, p. 185–186.

First state committee (New York Committee on employment planning has submitted first report, with plans for dealing with problem on a community basis. Report outlines 3 methods of dealing with unemployment: Individual efforts of employers, coöperative efforts of citizens, and through governmental agencies. Material was obtained from 200 or more employers working out regularization schemes.

Results of the efforts of citizens in Buffalo, Rochester and Albany are cited. In Indianapolis, Dayton, St. Paul and Minneapolis, and in New England, communities have also organized to study methods for employment stabilization.

UNEMPLOYMENT RELIEF

AMIDON, BEULAH. Ivorydale. *Survey*, April 1, 1930, Vol. 64, p. 18–22, 56–57, 61, 64.

Procter and Gamble Company guaranteed employment plan; which provides for 48 weeks of work during the year, a liberal scheme of sickness insurance and old age pensions, and opportunity to share in company's earnings through stock purchase.

Dismissal wage. *Monthly Labor Review*, April, 1930, Vol. 30, p. 715–719.

One of the earliest plans for the protection of the dismissed worker was introduced by the Delaware and Hudson Railroad in 1922 as part of group insurance plan. Methods now used by Dennison Manufacturing Co., Columbia Conserve Co., Consolidated Gas, Electric Light and Power Co., of New York, Firestone Tire and Rubber Company in taking care of their discharged employees are given. Agreement between Amalgamated Clothing Workers of America and employers provides for equal distribution of work among the regular cutters rather than their discharge. Mention is made of plan of the United States Rubber Company for taking care of employees when they lose their jobs, through merger or closing of the plant. Payment of dismissal wage in Germany, England, Japan, Mexico, and Greece is also discussed.

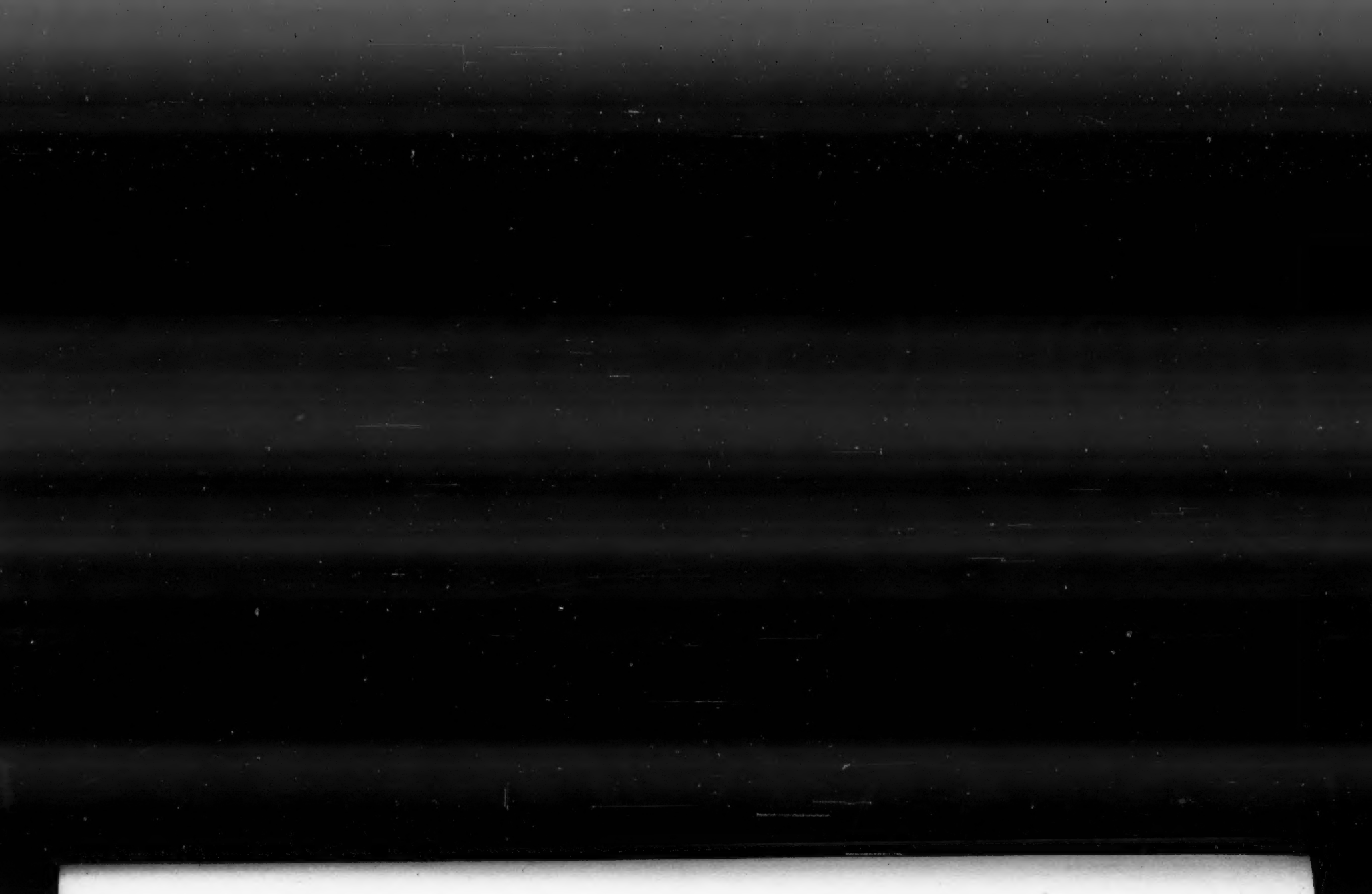
GIBSON, R. S. Incentive to work as affected by unemployment insurance and the poor law respectively. *Manchester School*, 1930, Vol. 1, p. 21–27.

Reasons are given why the Poor Law, rather than the Unemployment Insurance Bill, is responsible for reducing the will to work.

GILSON, MARY B. (Industrial Relations Counselors, Inc.) and Riches, E. J. (Research Division, International Labour Office). Employers' additional unemployment benefit schemes in Great tain. *International Labour Review*, March, 1930, Vol. 21, p. 348–394.

Describes such private schemes as are now in force and compares their financial organization, methods of administration, provisions concerning eligibility, types and rates of benefit paid, length of benefit period, etc. The conlusion is reached that these plans are important chiefly as a means of making benefits more in proportion to wages than is possible under the flat rate system of the state scheme.

UNION MANAGEMENT COÖPERATION

Naumkeag experiment, a case of employer-worker coöperation in a New England Textile mill. Management point of view, J. FOSTER SMITH; Union point of view, JOHN P. O'CONNELL; Technician's point of view, FRANCIS GOODELL. *Bulletin of the Taylor Society*, **April, 1930, Vol. 15, p. 63–77.**

This experiment to bring about greater coöperation between employer and employee, worked out by a 90-year old textile mill, has met with great success. The present problem of rearrangement of work, and the making of new schedules of wages, was worked out by supervising executives, who had intimate knowledge of the jobs, with a trained technician and a committee representing management and the Union. Text of the Agreement made in 1919 between the Union and the Naumkeag Company is given. The discussion is from three viewpoints: Management, the Union, and the Technicians.